

Make sure the drill is raised to clear all obstacles before towing or trimming (under compressor power).

## **DURING OPERATION**

Make sure the drill guide is raised to clear all obstacles before towing or trimming under compressor power).

Wear safety glasses while drilling, to prevent damage to the eyes.

Use extreme caution when walking alongside the unit while trimming. The propellers are fast-acting during starting and turning.

## **AFTER OPERATION**

When the hydraulic system is not in use, turn off pump to prevent pressure buildup.

Be sure compressor is shut off and pressure in lines released before disconnecting.

**Operator, Organizational, Direct and General Support,  
and Depot Maintenance Manual**

**DRILL, PNEUMATIC, DRIFTER: BOOM-TYPE;  
CRAWLER-MOUNTED; SELF-PROPELLED (INGERSOLL-RAND  
MODELS CM150A/D475A AND CM225/D475A)  
FSN 3820-854-4149 AND FSN 3820-410-5549**

TM 5-3820-239-15, 25 January 1968, is changed as follows:

The title is changed as shown above.

Page 1-1. Paragraph 1-1, CM225/D475A is deleted after CM150A/D475A.

Paragraph 1-3a. Delete Ingersoll-Rand Model 150A/D475A.

Page 1-2. Paragraph 1-4a, the following is added: MODEL CM225/D475A, CONTRACT DSA700-69-C-H056, FSN 3820-410-5549, DATE MFD—1969.

Paragraph 1-4b(1), the following is added:  
Model ..... CM225/D475A  
Serial No. .... CL23190 and CL23301 through 23349

Page 1-5. The following data is added to paragraphs indicated:

Paragraph 1-4b(5):

Paragraph 1-4b(15):  
Model ..... 1CYL840AA (CM225/D475A)

Paragraph 1-4b(16):  
Model ..... 1CYL840AE (CM225/D475A)

Paragraph 1-4b(17):  
Model ..... 1CYL840AR (CM255/D475A)

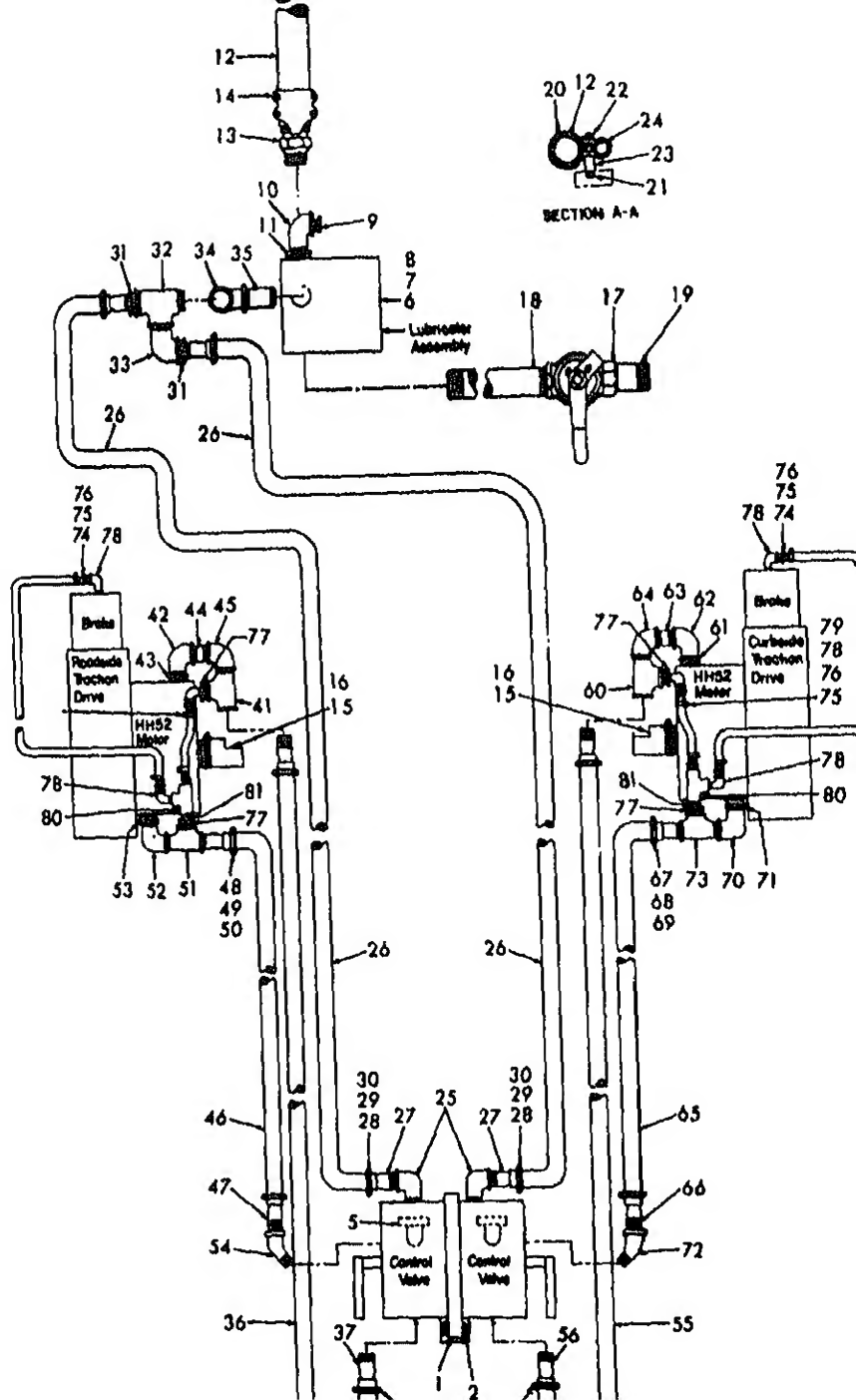
Paragraph 1-4b(18):  
Model ..... 1CYL840AF (CM225/D475A)

Paragraph 1-4b(19):  
Model ..... 1CYL840AC (CM225/D475A)

Page 1-6. Paragraph 1-5 is superseded as follows:

**1-5. Difference in Models.**

This manual covers the Ingersoll-Rand M CM150A/D475A and CM225/D475A pneumatic drills. There are differences between the models in the hydraulic pump coupling ext



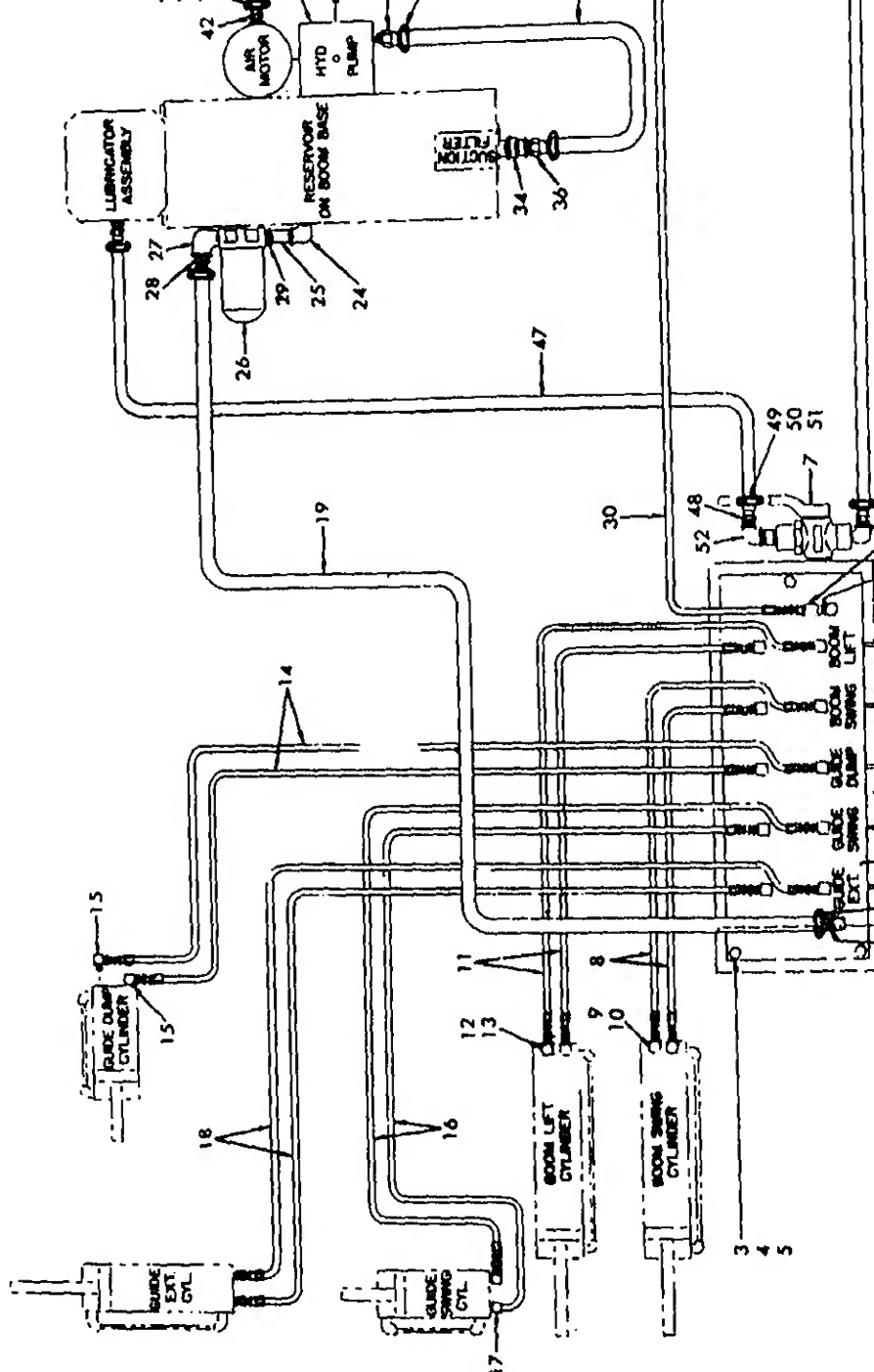
Street elbow, 1 in. NPT x 45° (2)  
 Lubricator assembly  
 Bolt, 3/8 in. x 1 1/2 in. lg (4)  
 Nut, 3/8 in. (4)  
 Reducing bushing, 1 in. x 1/2 in. NPT  
 Street elbow, 1 in. NPT x 90°  
 Reducing bushing, 1 in. x 1 1/4 in. NPT  
 Air hose, 2 in. x 17 ft 6 in. lg  
 Hose stem (2)  
 Hose clamp (2)  
 Hose, deflector (2)  
 Hose clamp (2)  
 Main air valve  
 Nipple, 2 in. NPT x 6 in. lg  
 Nipple, 2 in. NPT x 2 1/2 in. lg  
 Hose clamp, half (2)  
 Stud, 1/2 in. x 4 in. lg  
 Nut, 1/2 in.  
 Pipe, 1/2 in. NPT x 1 1/4 in. lg  
 Coupling, 3/4 in. NPT x 1 1/8 in. lg  
 Street elbow, 1 in. NPT x 90° (2)  
 Air hose, 1 in. x 32 in. lg (2)  
 Hose stem (4)

32 Street tee, 1 1/2 in. NPT  
 33 Street elbow, 1 1/2 in. NPT x 90°  
 34 Elbow, 1 1/2 in. NPT x 90°  
 35 Nipple, 1 1/2 in. NPT x 3 in. lg  
 36 Air hose, 1 in. x 72 in. lg  
 37 Hose stem (2)  
 38 Hose clamp, half (4)  
 39 Bolt, 3/8 in. x 2 1/4 in. lg (4)  
 40 Nut, 3/8 in. (4)  
 41 Street tee, 1 in. NPT  
 42 Street elbow, 1 in. NPT x 90°  
 43 Reducing bushing, 1 1/4 in. x 1 in. NPT  
 44 Nipple, 1 in. NPT x 1 1/2 in. lg  
 45 Elbow, 1 in. NPT x 90°  
 46 Air hose, 1 in. x 32 in. lg  
 47 Hose stem (2)  
 48 Hose clamp, half (4)  
 49 Bolt, 3/8 in. x 2 1/4 in. lg (4)  
 50 Nut, 3/8 in. (4)  
 51 Street tee, 1 in. NPT  
 52 Street elbow, 1 in. NPT x 90°  
 53 Reducing bushing, 1 1/4 in. x 1 in. NPT

58 Bolt, 3/8 in. x 2 1/4 in. lg  
 59 Nut, 3/8 in. (4)  
 60 Street tee, 1 in. NPT  
 61 Reducing bushing, 1 1/4 in. NPT  
 62 Street elbow, 1 in. NPT  
 63 Nipple, 1 in. NPT x 1 1/2 in.  
 64 Elbow, 1 in. NPT x 90°  
 65 Air hose, 1 in. x 32 in.  
 66 Hose stem (2)  
 67 Hose clamp, half (4)  
 68 Bolt, 3/8 in. x 2 1/4 in. lg  
 69 Nut, 3/8 in. (4)  
 70 Street elbow, 1 in. NPT  
 71 Reducing bushing, 1 1/4 in. NPT  
 72 Street elbow, 1 in. NPT  
 73 Street tee, 1 in. NPT  
 74 Air hose, 1/4 in. x 22 in.  
 75 Hose nipple (8)  
 76 Hose clamp (8)  
 77 Reducing bushing, 1/4 in. NPT (4)  
 78 Street elbow, 1/4 in. NPT (6)  
 79 Air hose, 1/4 in. x 12 in.  
 80 Shuttle valve, 1/4 in. NPT  
 81 Nipple, 1/4 in. NPT x 3/8 in.



Page 1-13. Figure 1-5.1 is added.



Hydraulic valve assembly	14 Hydraulic hose assembly (2)	27 Street elbow, 1 in. NPT x 90°	40 Hose stem
ing plate, hydraulic valve	15 Elbow (2)	28 Reducing bushing, 1 in. x ½ in. NPT	41 Hydraulic hose
in. x 3 in. lg (3)	16 Hydraulic hose assembly (2)	29 Reducing bushing, 1 in. x ¾ in. NPT	42 Hose stem (2)
in. (3)	17 Elbow (2)	30 Hydraulic hose assembly	43 Hose clamp, half
asher, ¾ in. (3)	18 Hydraulic hose assembly (2)	31 Elbow	44 Bolt, ¾ in. x 1¾
Hydraulic pump complete	19 Hydraulic hose	32 Nipple, ¾ in. NPT x 1 in. lg	45 Nut, ¾ in. (4)
ic valve complete	20 Hose stem (2)	33 Flow control valve, ¾ in. NPT	46 Street elbow, ½
Hydraulic hose assembly (2)	21 Hose clamp, half (4)	34 Reducing coupling, 1 in. x ¾ in. NPT	47 Hydraulic hose
ng bushing, 1½ in x ¾ in. (2)	22 Bolt, ¾ in. x 1¾ in. lg (4)	35 Hydraulic hose	48 Hose stem (2)
(2)	23 Nut, ¾ in. (4)	36 Hose stem	49 Hose clamp, half
Hydraulic hose assembly (2)	24 Street elbow, ¾ in. NPT x 90°	37 Hose clamp, half (4)	50 Bolt, ¾ in. x 1¾
ing bushing, 1½ in. x ¾ in. (2)	25 Nipple, ¾ in. NPT x 2½ in. lg	38 Bolt, ¾ in. x 1¾ in. lg (4)	51 Nut, ¾ in. (4)
(2)	26 Oil filter	39 Nut, ¾ in. (4)	52 Elbow, ½ in. NPT

Paragraph 3-13b is superseded.

b. Using a grease gun, fill each fitting until grease is forced out through the seals.

Page 6-43. Paragraph 6-52.1 is added.

#### **6-52.1. Disassembly (Model CM225/D475A)**

a. *Power Dump and Swing Assembly.* Refer to paragraph 6-52a.

b. *Hydraulic Cylinders.*

##### **NOTE**

The hydraulic cylinders are similar in construction. For maintenance purposes, a typical cylinder will be covered. Differences in the check valve parts do not affect the instructions appreciably.

(1) Remove capscrews (1, fig. 6-20.1) and lockwashers (2).

(2) Using a suitable spanner wrench, unscrew retainer ring (17).

##### **NOTE**

The retainer ring cannot be completely removed when unscrewed, since it may not fit over the fitting of the piston rod assembly.

(3) Slide piston rod assembly (19), with all parts attached, out of barrel assembly (29).

lock pin, backup ring, and rod end fitting. If repairing the hydraulic cylinder parts are not available separately, they are furnished in a service kit. F TM 5-3820-239-35P

Paragraph 6-55.1 is added.

#### **6-55.1. Reassembly (Model CM225)**

a. *Hydraulic Cylinders.*

##### **NOTE**

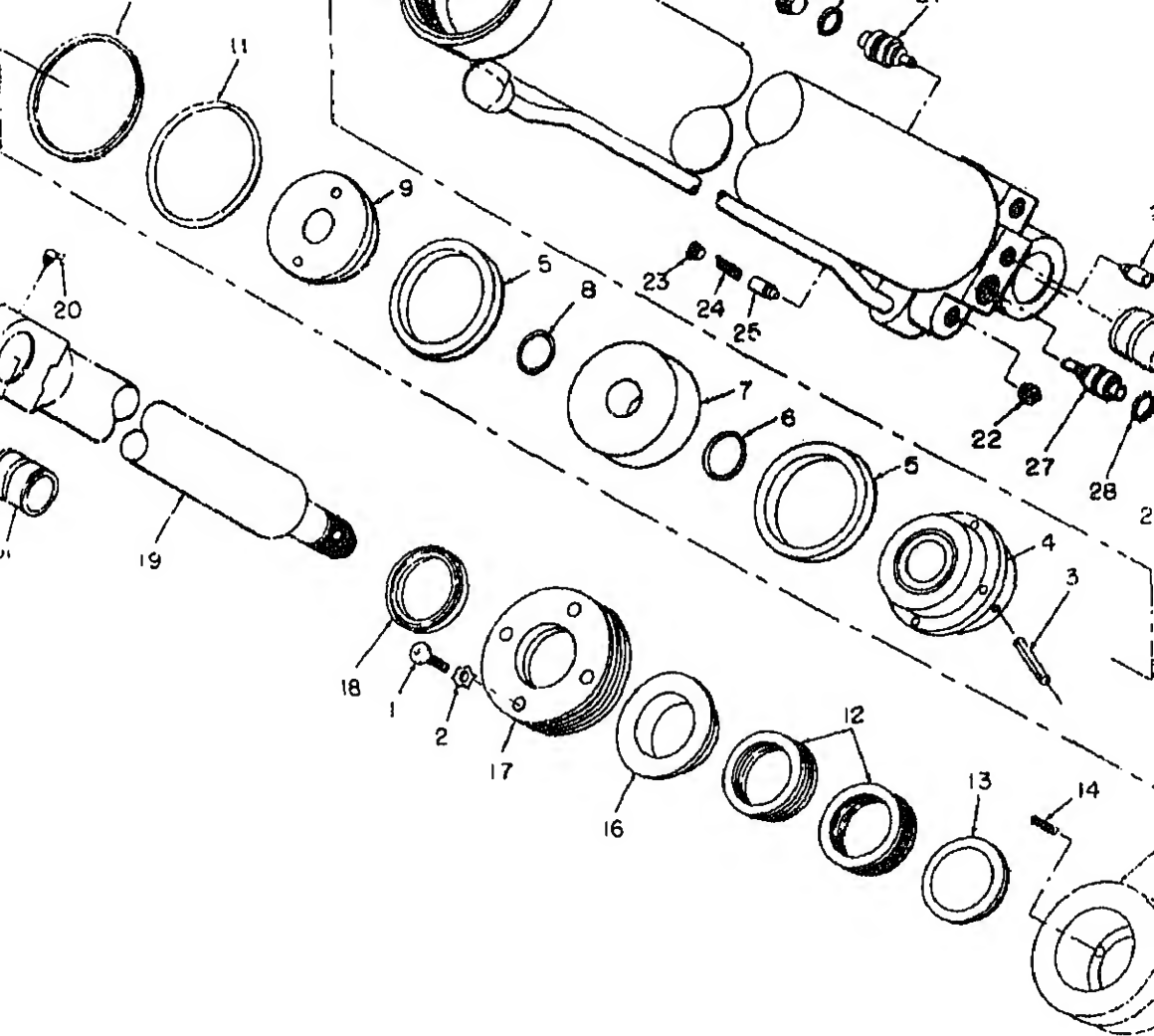
Coat all parts with clean hydraulic oil to aid in reassembly.

(1) Install all check valve parts in figure 6-20.1.

(2) Slide rod wiper (18), retainers (15) and gland nut (16) onto piston rod assembly (19).

(3) Install springs (14), male and female V-packing (12) into cylinder head. Mount O-ring (11) and backup ring (13) on cylinder head, and slide the assembled piston rod assembly (19). Install lockwashers (2) and retain the parts.

b. *Power Dump and Swing Assembly.* Refer to paragraph 6-55c.



ME 3820-239-15/6-

Thrust cone  
Lock washer  
Lock pin  
Rear backing plate  
U-cup  
O-ring  
Piston  
(2) plug

11 O-ring  
12 V-packing  
13 Male adapter  
14 Spring  
15 Cylinder head  
16 Gland nut  
17 Retainer ring  
18 Rod wiper

21 Bushing  
22 Pipe plug  
23 Pipe plug  
24 Spring  
25 Poppet  
26 Pipe plug  
27 Pilot check piston  
28 Piston ring

*Major General, United States Army,  
The Adjutant General.*

**Distribution:**

To be distributed in accordance with DA Form 12-25B (qty rqr Block No. 385), Operator requirements  
Drilling Machine.

**Operator's, Organizational, Direct Support and General  
Support Maintenance Manual  
DRILL, PNEUMATIC, DRIFTER:  
BOOM TYPE; CRAWLER-MOUNTED; SELF-PROPELLED  
(INGERSOLL-RAND MODELS CM150A/D475A  
AND CM225/D475A)  
FSN 3820-854-4149  
AND  
FSN 3820-410-5549**

TM 5-3820-239-15, 25 January 1968, is changed as follows:

*Page 2-1. Paragraph 2-2.1. is added after graph 2-2.*

The title is changed as shown above.

*Cover.* Inside the front cover, the following is added to the BEFORE OPERATION SAFETY PRECAUTIONS: "Drill should not be operated without striker bars."

*Page ii.* In the table of contents, Appendix B is rescinded.

**2-2.1. Maintenance and Operating  
Supplies**

Refer to table 2-1 for a complete list of maintenance and operating supplies required for operation of the drill.

Table 2-1. Maintenance and Operating Supplies

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required for initial operation	(5) Quantity required for 8 hrs operation	(6) Notes
FINAL DRIVE (1)	9150-577-5844 (2)	LUBRICATING OIL GEAR: 5 gal drum as follows: GO-90	3 qt	(3)	(1) Includes quantities for both units. (2) See C9100-1L for data and require- ment. (3) See current LO publication and re- quirement intervals.
	9150-257-5440 (2)	GOS	3 qt	(3)	(4) Reservoir capacity (5) Average oil consumption qt per hour of operation
	9150-265-9428 (2)	OIL, LUBRICATING: 5 gal pail as follows: OEID	40 qt (4)	(3)	
HYDRAULIC SERVOIR.	9150-242-7603	OIL, LUBRICATING: 8 gal pail as follows: OE-30	8 qt (4)	(5)	
	9150-265-9435 (2)	OE-10	8 qt (4)	(5)	
	9150-205-942 (2)	OILS	8 qt (4)	(5)	
MANIFOLD LUBRICATOR	9150-242-7603 (2)	LUBRICATING OIL GEAR: 5 gal drum as follows: GO-90	2 qt	(3)	
	9150-577-5844 (2)	GOS	2 qt	(3)	
	9150-257-5440 (2)	OIL LUBRICATING 5 gal drum as follows: OE-30		(3)	
AIR FEED MOTOR. (1)	9150-265-9435 (2)	OE-10		(3)	
	9150-265-9428 (2)	GREASE, MOLYBDENUM DISUL- FIDE: 5 lb can, GMD.		(3)	
	9150-223-4004 (2)	GREASE, AUTOMOTIVE AND ARTILLERY: 5 lb can, GAA.		(3)	
PROPELLING AIR MOTOR. (1)	9150-190-0955 (2)			(3)	
				(3)	
				(3)	
L. STEEL BITS				(3)	
				(3)	
				(3)	
BASE POINTS				(3)	
				(3)	
				(3)	

Page 2-7. Subparagraph 2-11d is added after subparagraph 2-11c(2)(f).

c.1. *Installing the shank piece (striker bar).*

(1) Loosen the chuck jaw retainer bolts and remove the chuck jaw retainer.

(2) Insert the shank end of the striker bar in the drill chuck.

(3) Slide the chuck jaw retainer over the end of the striker bar and bolt it to the front head of the drill.

### CAUTION

Operation of the drifter drill without the striker bar should not be attempted.

Page 2-9. Immediately after subparagraph 2-11d

operating it in only the forward (counter-clockwise) direction for a minimum period of 5 minutes.

Page 3-5. Subparagraph 3-9c is superseded as follows:

c. Fill with rock drill oil, MIL-L2104B, as necessary.

Page 3-9. In figure 3-7(2), TRACK ROLLER FITTINGS is changed to read "TRACK ROLLER GREASE FITTINGS."

Page A-1. In paragraph A6:

TB 740-93-2 is changed to read "TB 740-93-2"

TP 740-93-3 is changed to read "TM 740-93-3"

Page B-1. Appendix B is rescinded.



**Distribution:**

To be distributed in accordance with DA Form 12-25B (qty rqr block No. 385) Operator  
nance Requirements for Earth Drilling Machine.

**Operator, Organizational, Direct and  
General Support, and Depot Maintenance Manual  
DRILL, PNEUMATIC, DRIFTER:  
BOOM-TYPE; CRAWLER-MOUNTED; SELF-PROPELLED  
(INGERSOLL-RAND MODEL CM150A/D475A)  
FSN 3820-854-4149**

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	Paragraph
<b>CHAPTER 1. INTRODUCTION</b>	
Section I. General .....	1-1, 1-2
II. Description and tabulated data .....	1-3-1-5
<b>CHAPTER 2. INSTALLATION AND OPERATION INSTRUCTIONS</b>	
Section I. Service upon receipt of equipment .....	2-1-2-5
II. Movement to new worksite .....	2-6, 2-7
III. Controls and instruments .....	2-8, 2-9
IV. Operation of equipment .....	2-10-2-19
<b>CHAPTER 3. OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS</b>	
Section I. Special tools and equipment .....	3-1, 3-2
II. Lubrication .....	3-3, 3-4
III. Preventive maintenance service .....	3-5-3-7
IV. Operator's maintenance .....	3-8-3-14
V. Troubleshooting .....	3-15-3-21
VI. Hydraulic reservoir .....	3-22, 3-23
VII. Feed chain .....	3-24-3-28
VIII. Centralizer .....	3-29-3-31
IX. Drifter drill .....	3-32, 3-34
X. Traction unit .....	3-35, 3-36
XI. Automatic brakes .....	3-37, 3-38
XII. Tow hitch .....	3-39-3-41
XIII. Hydraulic pump assembly .....	3-42-3-44
XIV. Hydraulic cylinders .....	3-45-3-47
XV. Main air valve and manifold lubricator .....	3-48-3-50
XVI. Air feed motor .....	3-51-3-53
XVII. Remote control manifold .....	3-54-3-56
XVIII. Hydraulic valve, assembly .....	3-57-3-59
XIX. Propelling controls .....	3-60-3-62
<b>CHAPTER 4. DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS</b>	
Section I. General .....	4-1, 4-2
II. Description and tabulated data .....	4-3, 4-4
<b>CHAPTER 5. GENERAL MAINTENANCE INSTRUCTIONS</b>	
Section I. Special tools and equipment .....	5-1, 5-2
II. Troubleshooting .....	5-3-5-10

VII. Power dump and lifting assembly	6-57-6-82
IX. Power guide extension mounting	6-64-6-70
X. Hydraulic boom assembly	6-71-6-77
XI. Boom base assembly	6-78-6-84
XII. Complete traction drive	6-85-6-88
XIII. Main frame and track assembly	6-90-6-96
XIV. Traction unit	6-97-6-101

#### APPENDIX A. REFERENCES

##### B. BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES

##### C. MAINTENANCE ALLOCATION CHART

#### INDEX

# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

#### Scope

These instructions are published for use by personnel to whom the Ingersoll-Rand Model CM150A/D475A pneumatic drills are assigned. Chapters 1 through 3 provide information on operation, preventive maintenance service, and organizational maintenance of equipment, accessories, components, and attachments. Chapters 4 through 6 provide information for direct and general support and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components.

Appendix A contains a list of publications applicable to this manual. Appendix B contains the list of basic issue items authorized for the operator of this equipment, and the list of maintenance and operating supplies required for initial operation. Appendix C contains the maintenance allocation chart. Organizational, direct and general support, and depot maintenance repair parts and special tools are listed in TM 5-3820-239-20P and 35P.

c. Numbers in parenthesis following nomenclature callouts on illustrations indicate quantity; numbers preceding nomenclature callouts indicate preferred sequence.

d. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Recommendations should be submitted on DA Form 2028 (Recommended Changes to DA Publications), forwarded direct to the Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Blvd., St. Louis Mo. 63120.

#### 1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Record for Vehicles and Equipment).

b. For other record and report forms applicable to operator, crew, and organizational maintenance, refer to TM 38-750.

*Note.* Applicable forms, excluding Standard Form 46 (United States Government motor vehicle identification card) which is carried by the operator, should be kept in a canvas bag mounted on the equipment.

### Section II. DESCRIPTION AND TABULATED DATA

#### Description

*General.* The Ingersoll-Rand Model CM150A/D475A pneumatic drill (fig. 1-1) is a self-propelled, compressed air operated, crawler-mounted, boom-type drifter drill used for drilling holes in rocklike formations. The unit is designed to drill both vertical and horizontal holes.

portable compressor capable of supplying 100 cfm (cubic feet per minute) of air at 90 psi (pounds per square inch), and a 2-inch diameter hose are required to supply all operating air needed for drilling and tramming (propelling).

b. *Tramming.* The pneumatic drill tramming unit (fig. 1-1) is equipped with two 5-horsepower electric motors.

below.

c. *Towing the Pneumatic Drill.* The traction drive allows the propelling air motors to be declutched and the brake deactivated for towing. In this way, the tracks turn freely when the pneumatic drill is being towed to a new location. The tow hitch (fig. 1-2) provides a convenient connection point for towing purposes.

d. *Propelling Controls.* The propelling controls (fig. 1-2) are mounted on a propelling control arm which can be mounted in one of three locations for operator convenience. If the operator desires to stand on the operator's platform while tramming, the controls are mounted on a fixed bracket on top of the boom base (fig. 1-2). If the operator desires to walk either alongside or behind the pneumatic drill, the propelling controls are attached to a propelling control arm which can be swiveled to the side or to the rear of the unit. The propelling controls consist of two identical control valves, each of which controls one track independently of the other. The valves can be moved either forward or back, and are spring-returned to the center (off) position for safety. The independent action of each valve permits turning in a smaller radius than would normally be possible in a unit of this size.

e. *Drifter Drill Positioning.* The hydraulic boom assembly (fig. 1-1) consists of several hydraulically-operated (boom lift and boom swing) cylinders which position the entire drill guide and power dump and swing assembly as required for drilling operations. The complete range of boom travel is 100° in a horizontal direction and 82° in a vertical direction. The power dump and swing assembly (fig. 1-1) consists of a dump cylinder and swing cylinder which hydraulically position the drill guide at the desired drilling angle. The power dump and swing assembly permits a full 180° vertical

by a chain drive. The power dump and swing mounting contains a drill guide extension which is hydraulically controlled. The hydraulic valve (fig. 1-2) to lower the guide in order to place the foot piece against the ground for added stability. The drill itself is operated from the remote manifold, which has five valves, four of which are used. A rotation selector valve moves the drifter drill in the desired direction. A drill feed control valve moves the drill up and down. A drill throttle control valve selects the speed of drilling. A blow valve allows air to clean out the hole.

## 1-4. Identification and Tabulated Data

a. *Identification.* The Ingersoll-Rand CM150A/D475A pneumatic drill has a major identification plate. The information contained on the plate is listed below.

U.S. Army  
Drill, pneumatic, drifter  
MODEL—CM150A/D475A  
CONTR NO.—DAAK01-67-C-D096  
SER  
CAPACITY  
REG NO.  
FSN 3820-854-4149  
GVW 8,600 LB  
LG—192 IN.  
HGT—72 IN.  
W—84 IN.  
SHIP WT—8,600 LB  
CUBE—700 FT<sup>3</sup>  
DATE MFD—1967  
ENG SER  
WARRANTY  
DATE SHIPPED  
DATE INSP  
INSP STAMP  
MFD BY—Ingersoll-Rand

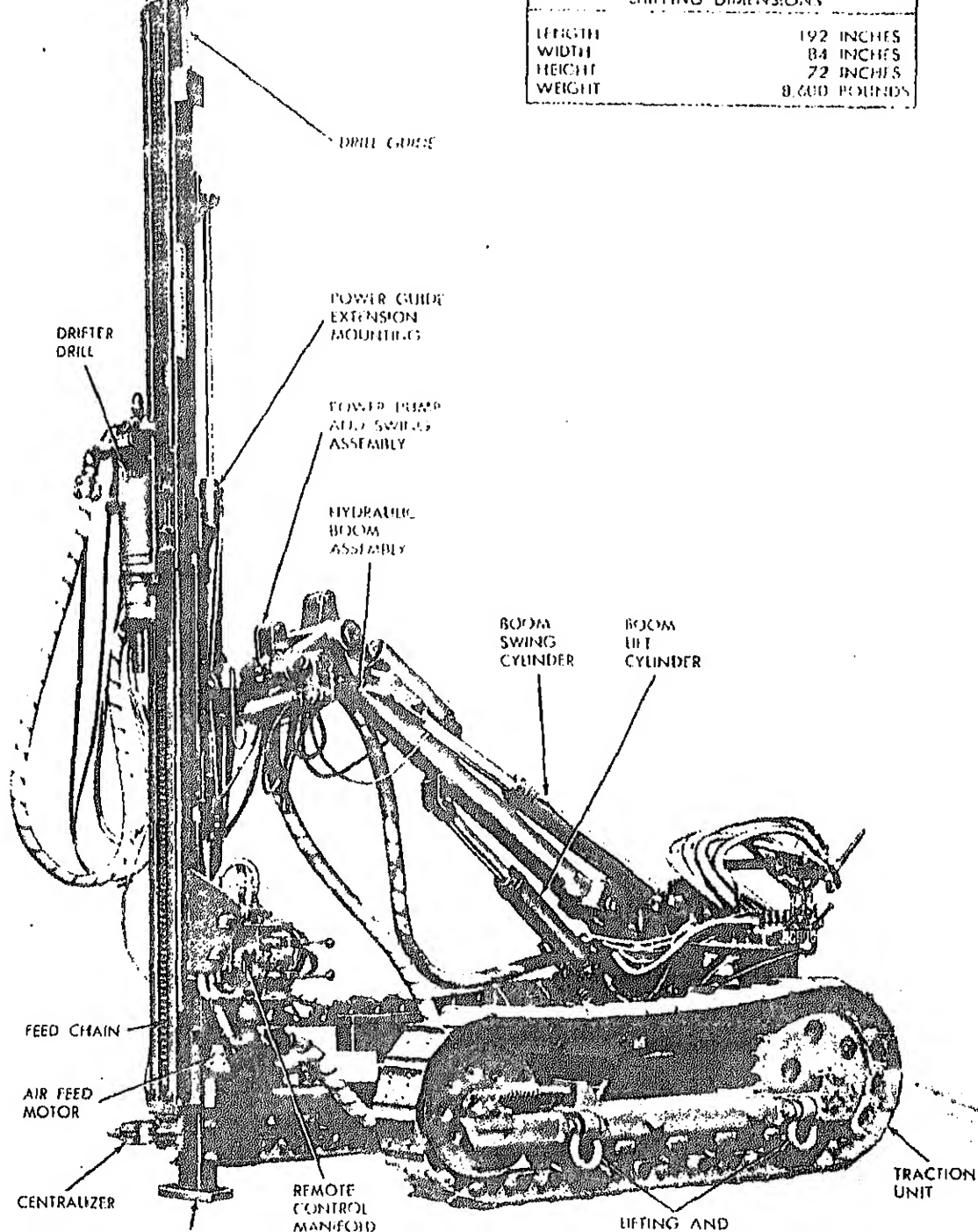
### b. *Tabulated Data.*

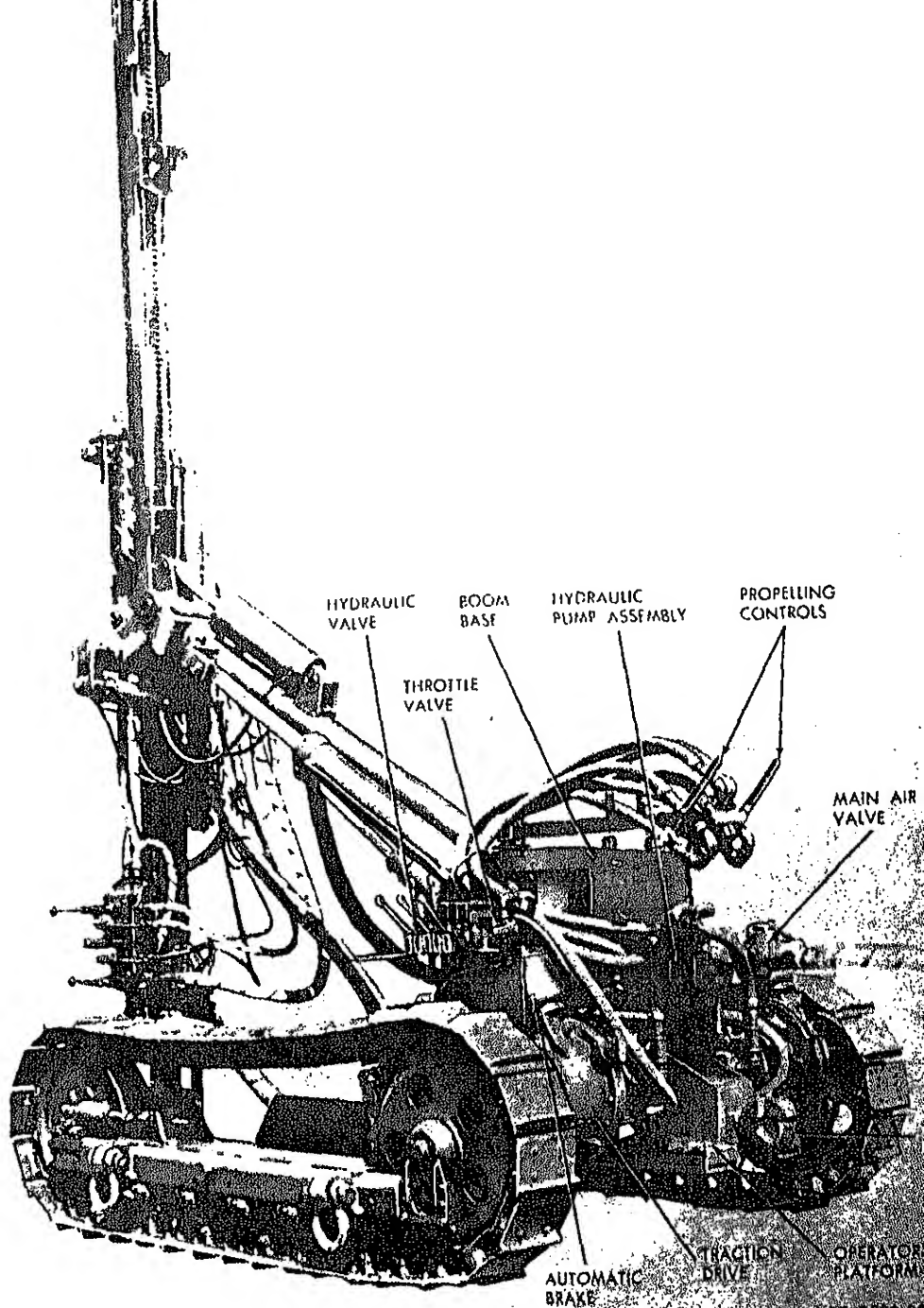
#### (1) *Pneumatic drill.*

Manufacturer -----Ingersoll-Rand

SHIFTING DIMENSIONS

LENGTH	192 INCHES
WIDTH	84 INCHES
HEIGHT	72 INCHES
WEIGHT	8,600 POUNDS





(3) *Tow hitch.*  
 Manufacturer ----- Holland-Hitch Co  
 Model ----- 760-1

(4) *Hydraulic pump.*  
 Manufacturer ----- Vickers, Inc.  
 Model ----- V110-15-1A-10-LHS85  
 Type ----- Vane

(5) *Hydraulic pump coupling.*  
 Manufacturer ----- Link Belt Co  
 Model ----- RC-5010  
 Type ----- Flexible

(6) *Propelling air motors.*  
 Manufacturer ----- Ingersoll-Rand  
 Model ----- HH52

(7) *Drill steel centralizer.*  
 Manufacturer ----- Ingersoll-Rand  
 Model ----- A45CM150A

(8) *Drill feed chain.*  
 Manufacturer ----- Link-Belt Co  
 Model ----- RC80SU  
 Type ----- Roller

(9) *Throttle valve.*  
 Manufacturer ----- Hose Accessories Co  
 Model ----- LE-HI VF-50  
 Size ----- 1/2 in. NPT

(10) *Return line oil filter.*  
 Manufacturer ----- Vickers, Inc.  
 Model ----- OFM-101  
 Size ----- 1 in. NPT

(11) *Main air valve.*  
 Manufacturer ----- Homestead Valve Mfg Co  
 Model ----- 1112  
 Size ----- 2 in.

(12) *Drain plugs.*  
 Manufacturer ----- Lisle Corp  
 Type ----- Magnetic

(13) *Air feed motor assembly.*  
 Manufacturer ----- Ingersoll-Rand  
 Model ----- 128CM150A

(14) *Propelling motor control valve.*  
 Manufacturer ----- Galland-Henning Nopak  
 Div

relief poppet  
 (16) *Dump cylinder.*  
 Manufacturer ----- Benton Harbor Eng  
 ing Works Inc  
 Model ----- 1CYL640K  
 Type ----- Hydraulic with ther  
 relief poppet

(17) *Swing cylinder.*  
 Manufacturer ----- Benton Harbor Eng  
 ing Works Inc  
 Model ----- 1CYL640J  
 Type ----- Hydraulic with ther  
 relief poppet

(18) *Boom lift cylinder.*  
 Manufacturer ----- Benton Harbor Eng  
 ing Works Inc  
 Model ----- 1CYL640G  
 Type ----- Hydraulic with ther  
 relief poppet

(19) *Boom swing cylinder.*  
 Manufacturer ----- Benton Harbor Eng  
 ing Works Inc  
 Model ----- 1CYL640F  
 Type ----- Hydraulic with ther  
 relief poppet

(20) *Nut and bolt torque data.*  
 Return line oil filter 12 to 15 ft-lb (foot-  
 mounting bolt. pounds)  
 Traction unit sprocket 150 ft-lb  
 stud nuts.  
 Pipe plugs  
 1/8 in. ----- 15 to 20 ft-lb  
 1/4 in. ----- 40 to 50 ft-lb  
 3/8 in. ----- 90 to 100 ft-lb  
 1/2 in. ----- 140 to 150 ft-lb  
 5/8 in. ----- 180 to 200 ft-lb  
 3/4 in. ----- 240 to 250 ft-lb  
 1 in. ----- 340 to 350 ft-lb

Bolts and nuts (thread  
 size).  
 No. 2 ----- 2 in.-lb (inch-pound)  
 No. 3 ----- 3 in.-lb  
 No. 4 ----- 4 in.-lb  
 No. 6 ----- 6 in.-lb  
 No. 8 ----- 8 in.-lb  
 No. 10 ----- 10 in.-lb



7/8 in. ....	140 to 160 ft-lb
1 in. ....	200 to 210 ft-lb
1 1/8 in. ....	280 to 300 ft-lb
1 1/4 in. ....	380 to 400 ft-lb
1 3/8 in. ....	430 to 470 ft-lb
1 1/2 in. ....	500 to 550 ft-lb

(21) *Dimensions and weight (fig. 1-1).*

Overall height (guide vertical).	16 ft (feet)
Overall length (less boom and guide).	8 ft, 10 in.
Rack width .....	7 ft
Rack length .....	8 ft, 8 in.

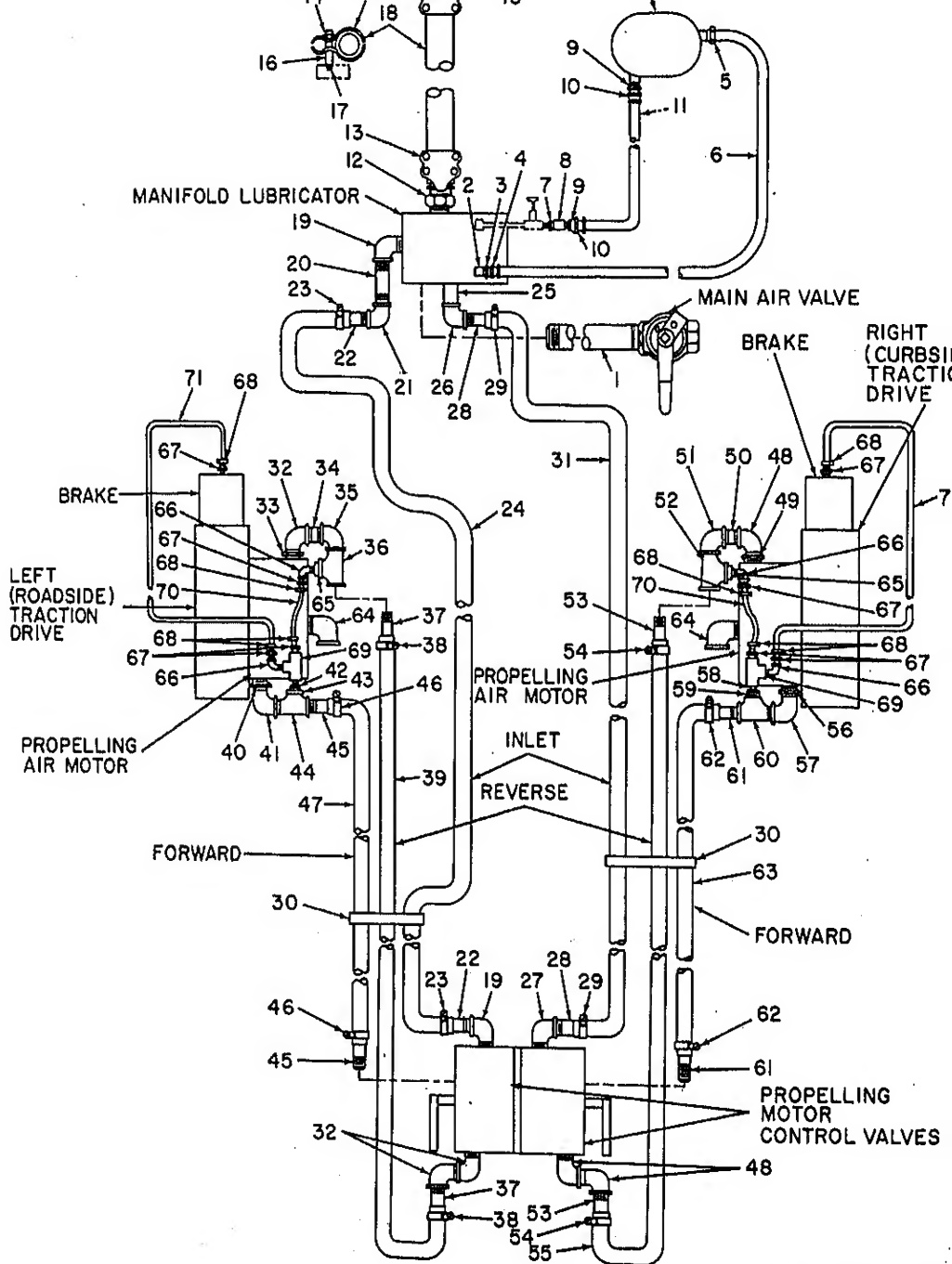
Figure 1-1 for arm control p  
agram.

(23) *Hydraulic piping diagram.* See  
1-5.

## 1-5. Difference in Models

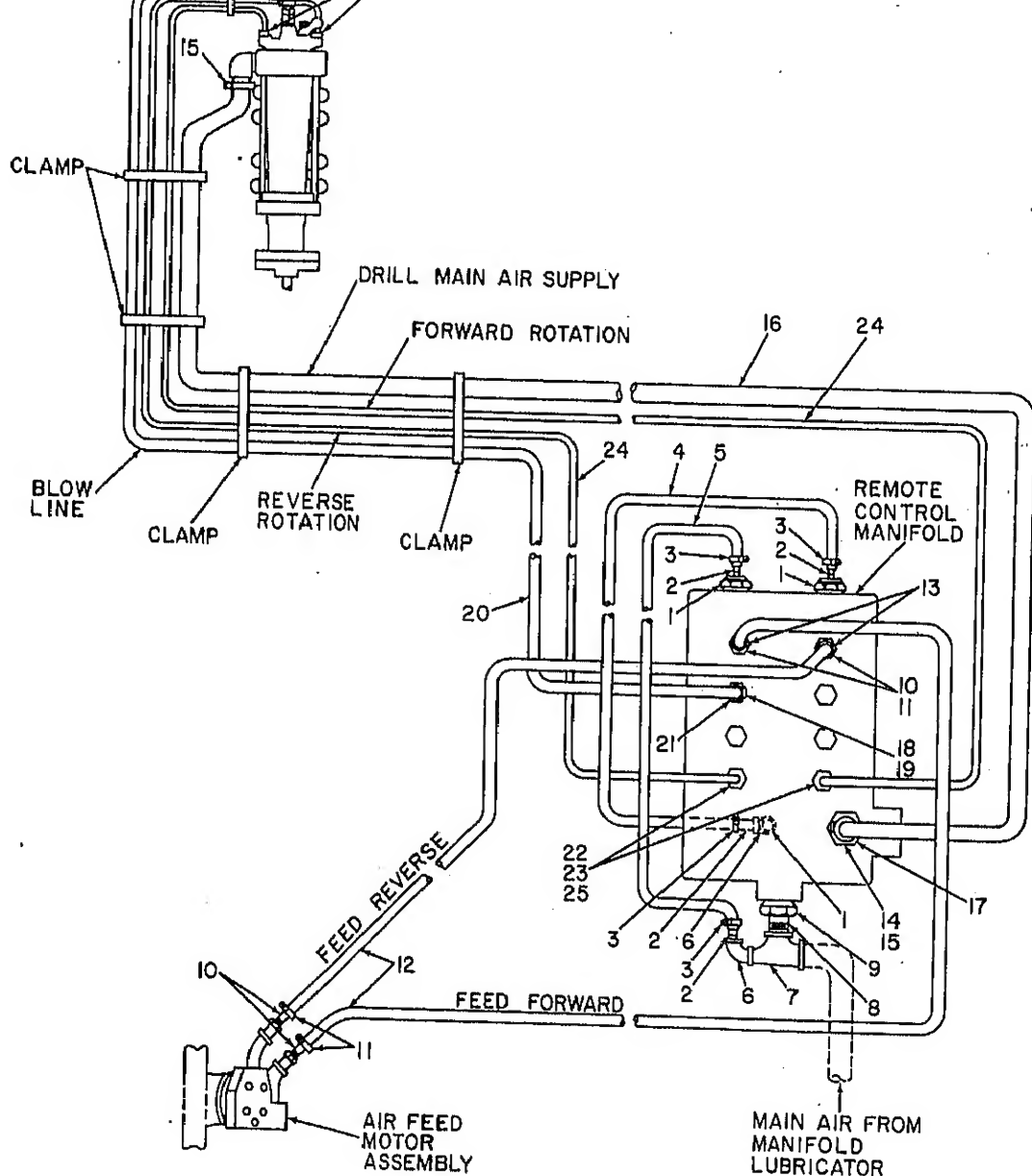
This manual covers only the Ingers  
Model CM150A/D475A pneumatic d  
known unit differences exist for th  
covered by this manual.





8	Coupling, 3/8 x 1 3/16 in.	43	Reducing bushing, 1 to 1/4 in.
9	Adapter (2)	44	Street tee, 1 in.
10	Universal swivel (2)	45	Hose stem (2)
11	Hose, 21 in.	46	Hose clamp (2)
12	Hose stem (2)	47	Air hose, 1 in. x 6 ft
13	Hose clamp (2)	48	Street elbow, 90° x 1 in. (3)
14	Stop nut, 1/2 in.	49	Reducing bushing, 1 1/4 to 1 in.
15	Hose clamp half (2)	50	Nipple, 1 x 1 1/2 in.
16	Pipe, 1/2 x 1 1/4 in.	51	Elbow, 90° x 1 in.
17	Stud, 1/2 x 4 in.	52	Street tee, 1 in.
18	Air hose, 2 in. x 17 1/2 ft	53	Hose stem (2)
19	Street elbow, 90° x 1 in. (2)	54	Hose clamp (2)
20	Nipple, 1 x 5 in.	55	Air hose, 1 x 103 in.
21	Elbow, 90° x 1 in.	56	Reducing bushing, 1 1/4 to 1 in.
22	Hose stem (2)	57	Street elbow, 90° x 1 in.
23	Hose clamp (2)	58	Close nipple, 1/4 x 7/8 in.
24	Airhose, 1 in. x 7 1/2 ft	59	Reducing bushing, 1 to 1/4 in.
25	Nipple, 1 x 2 in.	60	Street tee, 1 in.
26	Elbow, 90° x 1 in.	61	Hose stem (2)
27	Street elbow, 90° x 1 in.	62	Hose clamp (2)
28	Hose stem (2)	63	Air hose, 1 x 93 in.
29	Hose clamp (2)	64	Street elbow, 90° x 1 1/4 in. (2)
30	Hose clamp, 2 1/8 ID x 2 1/2 OD x 3/4 in. thk (6)	65	Reducing bushing, 1 to 1/4 in. (2)
31	Air hose, 1 in. x 7 1/2 ft	66	Street elbow, 90° x 1/4 in. (4)
32	Street elbow, 90° x 1 in. (3)	67	Hose nipple, 1/4 in. (8)
33	Reducing bushing, 1 1/4 to 1 in.	68	Hose clamp, 1/4 in. (8)
34	Nipple, 1 x 1 1/2 in.	69	Shuttle valve (2)
35	Elbow, 90° x 1 in.	70	Air hose, 1/4 x 12 in. (2)
		71	Air hose, 1/4 x 22 in.

Figure 1-3—Continued.

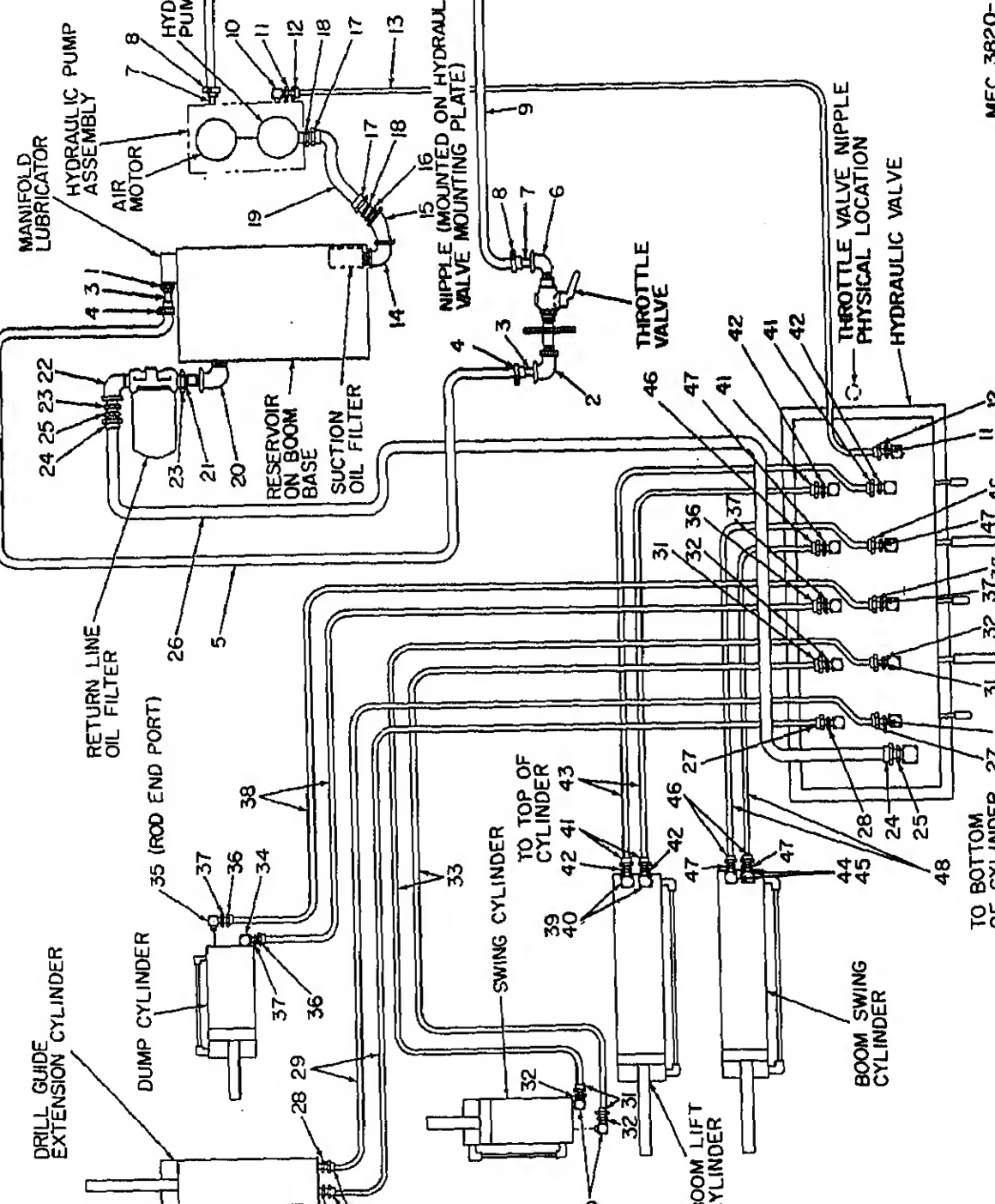


- 7 Reducing tee, 2 x 2 x 3/4 in.
- 8 Nipple, 2 x 2 in.
- 9 Reducing bushing, 2 1/2 to 2 in.
- 10 Hose stem, 3/4 in. (4)
- 11 Hose clamp (4)
- 12 Air hose, 3/4 x 30 in. (2)
- 13 Reducing bushing, 1 to 3/4 in. (2)

- 20 Air hose, 3/4 in. x 17 ft
- 21 Reducing bushing, 1 to 3/4 in.
- 22 Adapter (4)
- 23 Swivel (4)
- 24 Air hose, 3/8 in. x 18 ft (2)
- 25 Reducing bushing, 3/4 to 3/8 in.

*Figure 1-4—Continued.*

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34	Elbow	35	Elbow, with 3/64 in. dia restriction
36	Hose fitting (4)	37	Hose fitting (4)
38	Adapter (4)	39	Hose, 151 in. long (2)
40	Reducing bushing, 1/2 to 3/8 in. (2)	41	Elbow (2)
42	Hose fitting (4)	43	Adapter (4)
44	Hose, 45 in. long (2)	45	Reducing bushing, 1/2 to 3/8 in. (2)
46	Elbow (2)	47	Hose fitting (4)
48	Adapter (4)		Hose, 33 in. long (2)
18	Adapter (2)	19	Hose, 3/4 x 9 in.
20	Street elbow, 3/4 in. x 90°	21	Nipple, 3/4 x 2 1/2 in.
22	Street elbow, 1 in. x 90°	23	Reducing bushing, 1 to 3/4 in. (2)
24	Hose fitting (2)	25	Adapter (2)
26	Hose, 3/4 x 56 in.	27	Hose fitting (4)
28	Adapter (4)	29	Hose, 181 in. long (2)
30	Elbow, with 3/64 in. dia restriction orifice (2)	31	Hose fitting (4)
32	Adapter (4)	33	Hose, 151 in. long (2)
34	Elbow	35	Elbow, with 3/64 in. dia restriction
36	Hose fitting (4)	37	Hose fitting (4)
38	Adapter (4)	39	Hose, 151 in. long (2)
40	Reducing bushing, 1/2 to 3/8 in. (2)	41	Elbow (2)
42	Hose fitting (4)	43	Adapter (4)
44	Hose, 45 in. long (2)	45	Reducing bushing, 1/2 to 3/8 in. (2)
46	Elbow (2)	47	Hose fitting (4)
48	Adapter (4)		Hose, 33 in. long (2)
18	Adapter (2)	19	Hose, 3/4 x 9 in.
20	Street elbow, 3/4 in. x 90°	21	Nipple, 3/4 x 2 1/2 in.
22	Street elbow, 1 in. x 90°	23	Reducing bushing, 1 to 3/4 in. (2)
24	Hose fitting (2)	25	Adapter (2)
26	Hose, 3/4 x 56 in.	27	Hose fitting (4)
28	Adapter (4)	29	Hose, 181 in. long (2)
30	Elbow, with 3/64 in. dia restriction orifice (2)	31	Hose fitting (4)
32	Adapter (4)	33	Hose, 151 in. long (2)

Figure 1-5—Continued.





## CHAPTER 2

# INSTALLATION AND OPERATION INSTRUCTIONS

### Section I. SERVICE UPON RECEIPT OF EQUIPMENT

#### Unloading Equipment

The pneumatic drill is equipped with two lugs and tie down lugs (fig. 1-1) on each side of the track frame for crane handling. When unloading the unit from the flatcar or rail bed, use a spreader bar located over the center of gravity (fig. 2-1).

**Warning:** Do not attempt to lift the pneumatic drill unless the drill guide is positioned and latched. If this procedure is not followed, tilting of the load may occur which can cause damage to the equipment and severe injury to personnel in the area.

#### Unpacking Equipment

The pneumatic drill is shipped completely assembled and is not packed in any exterior containers or crates.

#### Inspecting and Servicing Equipment

Refer to the basic issue items list (app. B) for a check for the presence of all required materials. Check all parts for insecure mounting. Tighten all loose mounting screws and caps. Refer to paragraph 3-6 for daily preventive maintenance services to be performed. Visually check the pneumatic drill for missing parts and for damage that may have occurred during shipment. Carefully check all hoses and fittings for abrasion and tightness.

#### Installation of Separately Packed

#### 2-5. Installation or Setting up Instructions

##### a. Location.

##### (1) Towing.

- (a) If the pneumatic drill is to be towed to the desired worksite, disengage the clutch on each propelling air motor by pulling the clutch lock pin handle (fig. 2-2) out to the retracted position, and turning the handle to lock it in this position.

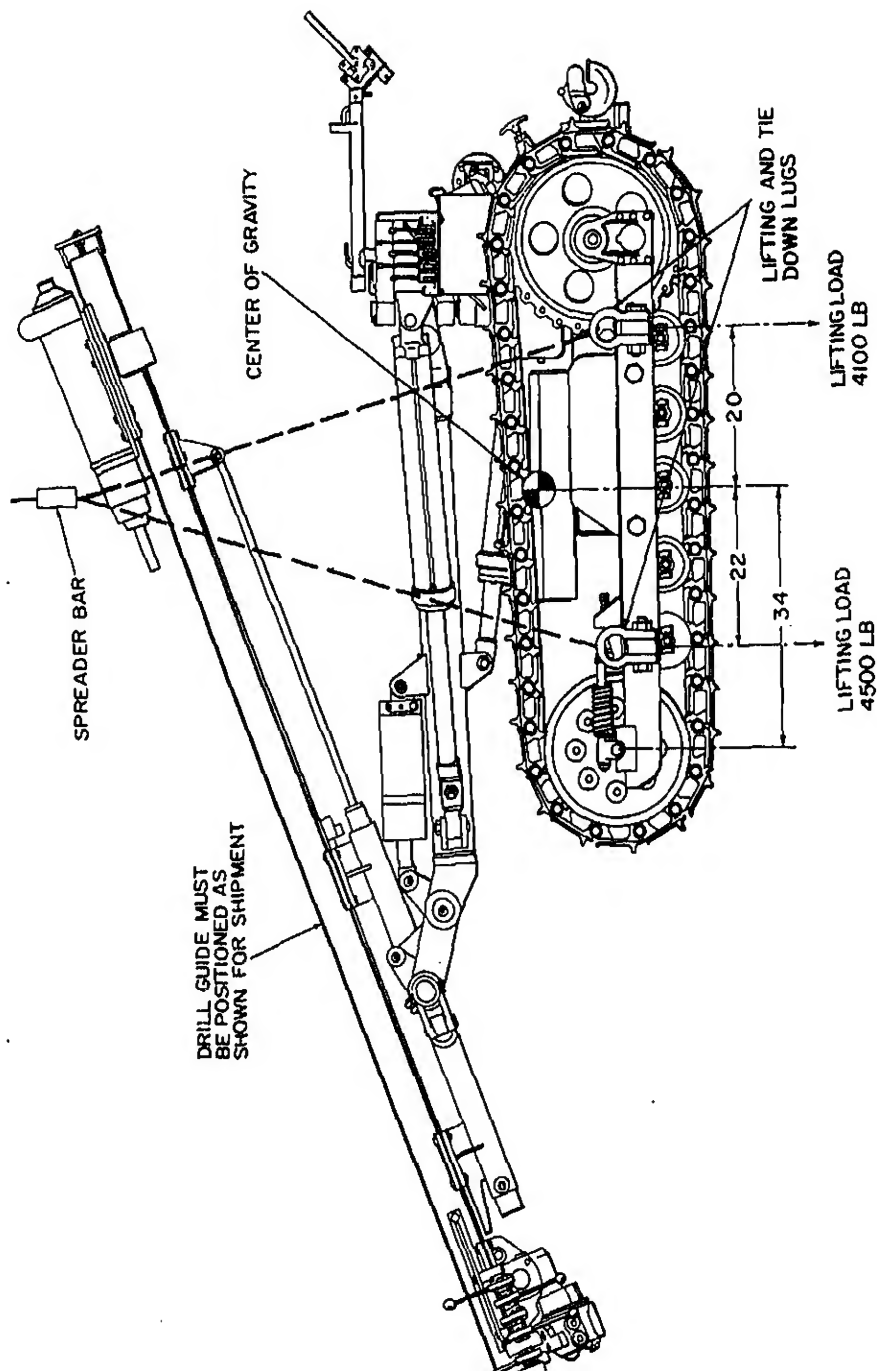
**Caution:** If the clutches are disengaged before towing, damage to the internal parts of the drill will occur.

- (b) Release the automatic brake on the propelling air motors by turning in (clockwise) the set screw (fig. 2-2) on each brake cylinder. Tighten the locknut to retain the setting.

**Caution:** Do not tow the pneumatic drill at speeds greater than 4 mph (miles per hour). Be sure that the drill guide is high enough to clear obstacles.

##### (2) Trimming.

- (a) Engage the clutch on each propelling air motor by releasing the clutch lock pin handle (fig. 2-2). Turn the handle either right or left until it releases and pulls out. If the lock pin does not snap out,



NOTE:  
ALL DIMENSIONS  
ARE IN INCHES.

aligned with the pin. Refer to paragraph 2-5b for connections required.

**Warning:** If the clutch lock pin handle is engaged when air is directed to the propelling air motors, the unit will move forward quickly. Under no circumstances attempt to pull the propelling motor control handle back to cause reverse tramping while standing near the clutch.

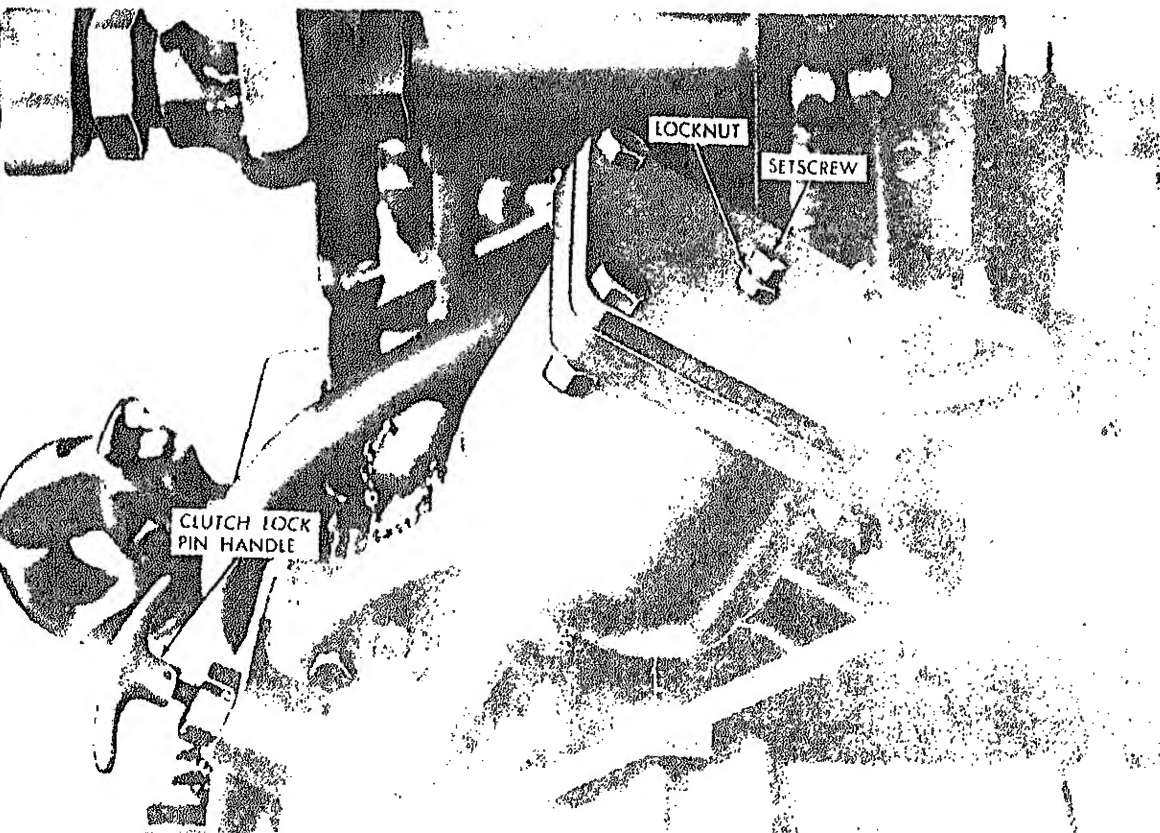
- (b) Set the propelling motor automatic brakes by unscrewing (counter-

clockwise) the setscrew (fig. 2-5b) on each brake cylinder. When the setscrew is free of piston drag, tighten the locknut to retain setting.

**Caution:** Be sure that the guide is raised high enough to clear obstacles.

*b. Connections.*

- (1) Blow out the main air hose from the compressor, to assure that all foreign material is removed from the line. If the hose is new, coat the inside



air pressure loss.

- (2) Disconnect the 1 1/2 inch main hose at the drifter drill and blow out the line for several minutes to remove trapped moisture and dirt.

**Caution:** If the air hose is new, allow the compressor to run with the hose disconnected from the drifter

ply coated with oil must be open).

- (3) Connect the hoses and tighten for tightness.

c. *Lubrication.* Before attempting to make sure that the pneumatic drill is properly lubricated. Refer to paragraph 3 for preventive maintenance services.

## Section II. MOVEMENT TO NEW WORKSITE

### 2-6. Dismantling for Movement

a. If the pneumatic drill is to be moved a short distance by tramping, no dismantling is required. Follow the procedures of paragraph 2-5a(2).

b. If the pneumatic drill is to be moved by towing, disconnect the compressor hose, and use the tow hitch located at the rear of the

unit (fig. 1-2). Follow the procedures of paragraph 2-5a(1). For longer distances, use a trailer to transport by rail or trail to position the drill guide as shown before lifting.

### 2-7. Reinstallation After Movement

Refer to paragraph 2-5 for procedures.

## Section III. CONTROLS AND INSTRUMENTS

### 2-8. General

This section describes, locates, illustrates and furnishes operator, crew, or organizational maintenance personnel sufficient information about various controls and instruments for

proper operation of the pneumatic drill.

### 2-9. Controls and Instruments

The purpose of controls and instruments and their normal settings are illustrated in figure 2-3.

## Section IV. OPERATION OF EQUIPMENT

### 2-10. General

a. Instructions in this section are published for information and guidance of personnel responsible for operation of the pneumatic drill.

b. The operator must know how to perform every operation of which the pneumatic drill is capable. This section gives instructions on starting and stopping the pneumatic drill, basic motions of the pneumatic drill, and on coordinating basic motions to perform specific tasks.

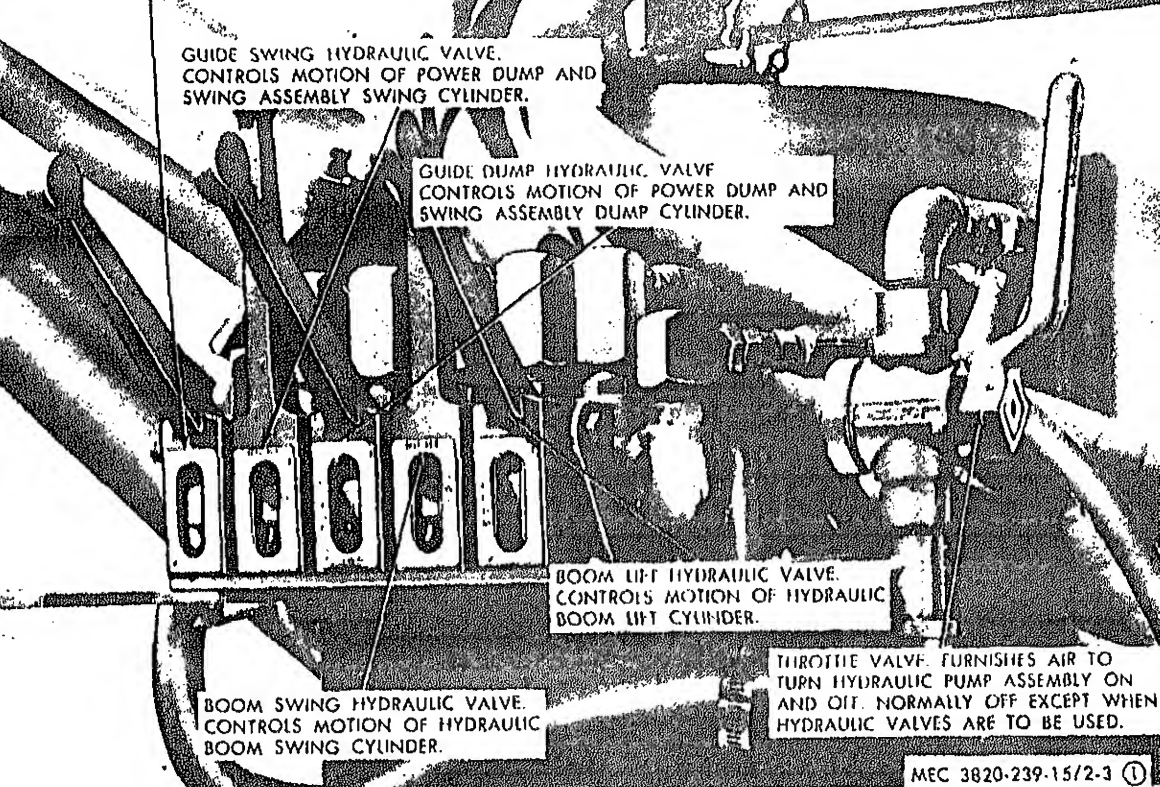
the operator may have to vary his operation to fit the individual job.

### 2-11. Starting

#### a. General.

- (1) Perform necessary daily preventive maintenance services (fig. 2-3).
- (2) Turn on main air valve.

#### b. Tramping.



MEC 3820-239-15/2-3 ①

*Figure 2-3(1). Controls and instruments.*

(2) Follow the propelling procedure as follows:

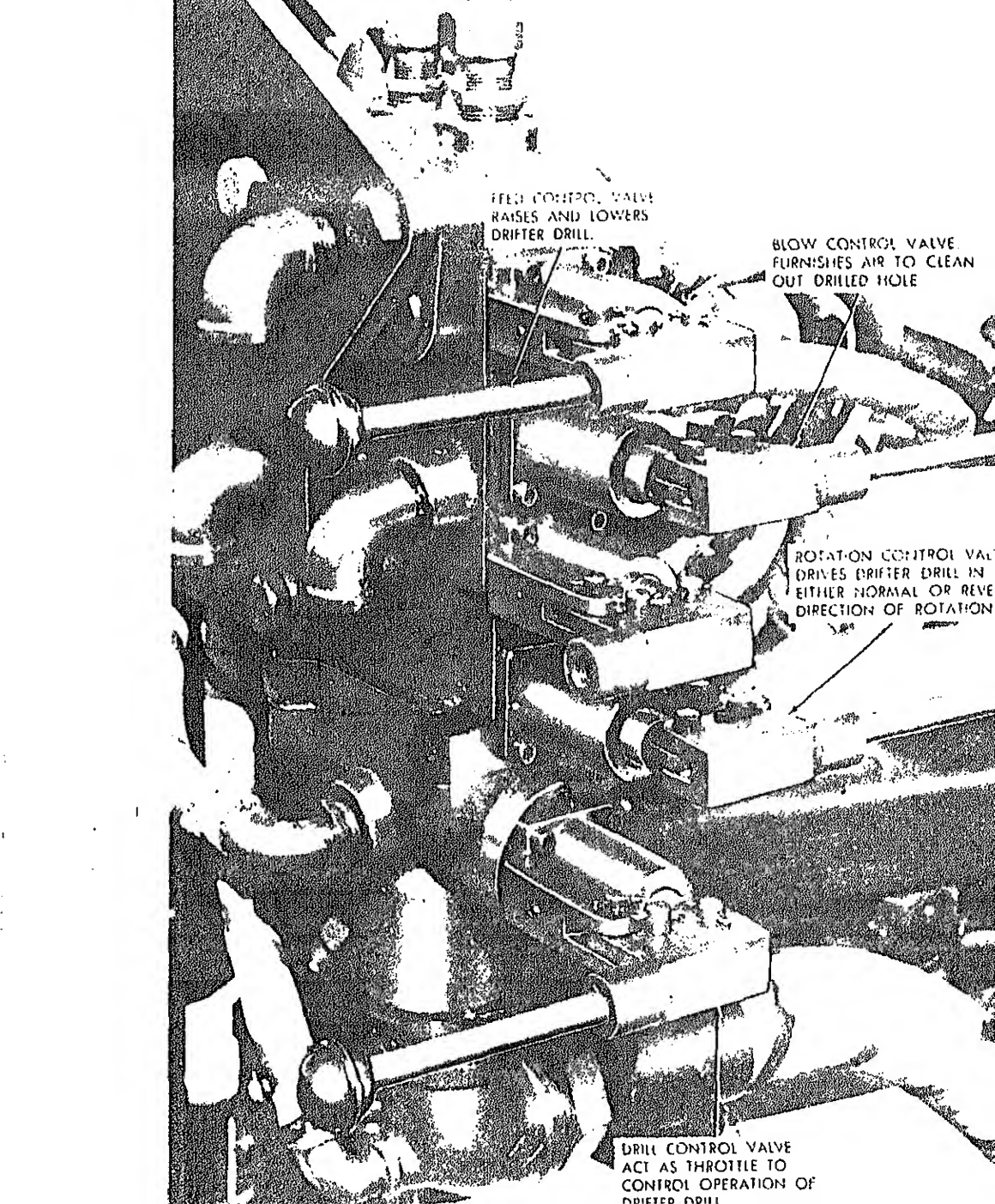
- (a) To propel straight forward—push both control handles forward at the same time.
- (b) To propel in reverse—pull both control handles toward operator at the same time.
- (c) To make a sharp left turn—push the right hand control handle forward and pull the left hand control toward the operator at the same time.
- (d) To make a sharp right turn—push the left hand control handle for-

ward and pull the right hand control handle toward operator at same time.

- (e) To make a gradual right turn—push the left hand control handle forward, allow the right hand control handle to remain in neutral.
- (f) To make a gradual left turn—pull the right hand control handle forward, allow the left hand control handle to remain in neutral.
- (g) Care should be exercised as propelling motors are fast acting especially in starting and turning.

*c. Positioning the Drill Guide.*

- (1) Turn on the hydraulic pump by

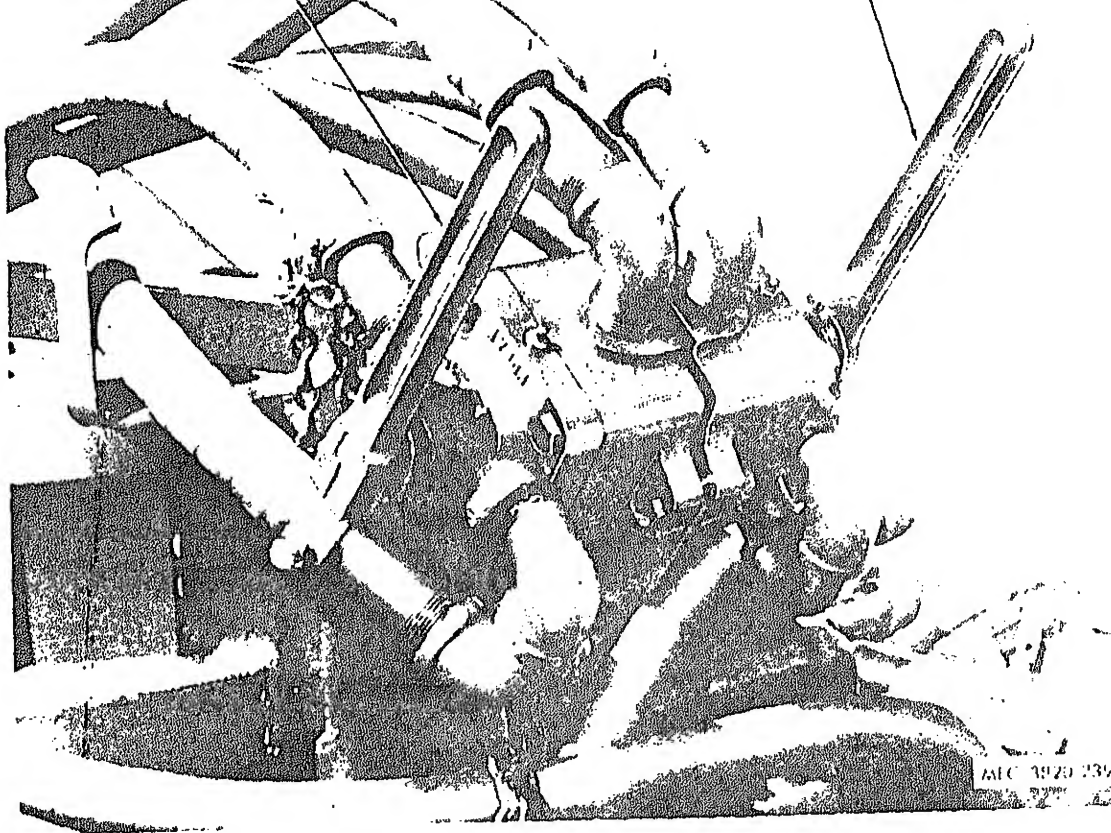


FEED CONTROL VALVE  
RAISES AND LOWERS  
DRIFTER DRILL.

BLOW CONTROL VALVE  
FURNISHES AIR TO CLEAN  
OUT DRILLED HOLE

ROTATION CONTROL VALVE  
DRIVES DRIFTER DRILL IN  
EITHER NORMAL OR REVERSE  
DIRECTION OF ROTATION

DRILL CONTROL VALVE  
ACT AS THROTTLE TO  
CONTROL OPERATION OF  
DRIFTER DRILL



*Figure 2-3(3)—Continued.*

so that the handle is in the same direction as the piping.

(2) Position the drill guide as required by following the procedure:

(a) To raise the boom—move the boom lift lever to the "UP" position. To lower the boom—move the boom lift lever to the "DOWN" position.

(b) To move the boom to the right—move the boom swing lever to the "RIGHT" position. To move the boom to the left—move the boom swing lever to the "LEFT" position.

"UP" position. To tilt guide down—move the guide lever to the "DOWN" position.

(d) To swing the drill guide right—move the guide swing lever to the "RIGHT POSITION". To swing the drill guide left—move the guide swing lever to the "LEFT POSITION".

(e) To raise the drill guide—move the guide extension lever to the "UP" position. To lower the drill guide—move the guide extension lever to the "OUT" position.

(f) Turn off pump when hydraulic controls by



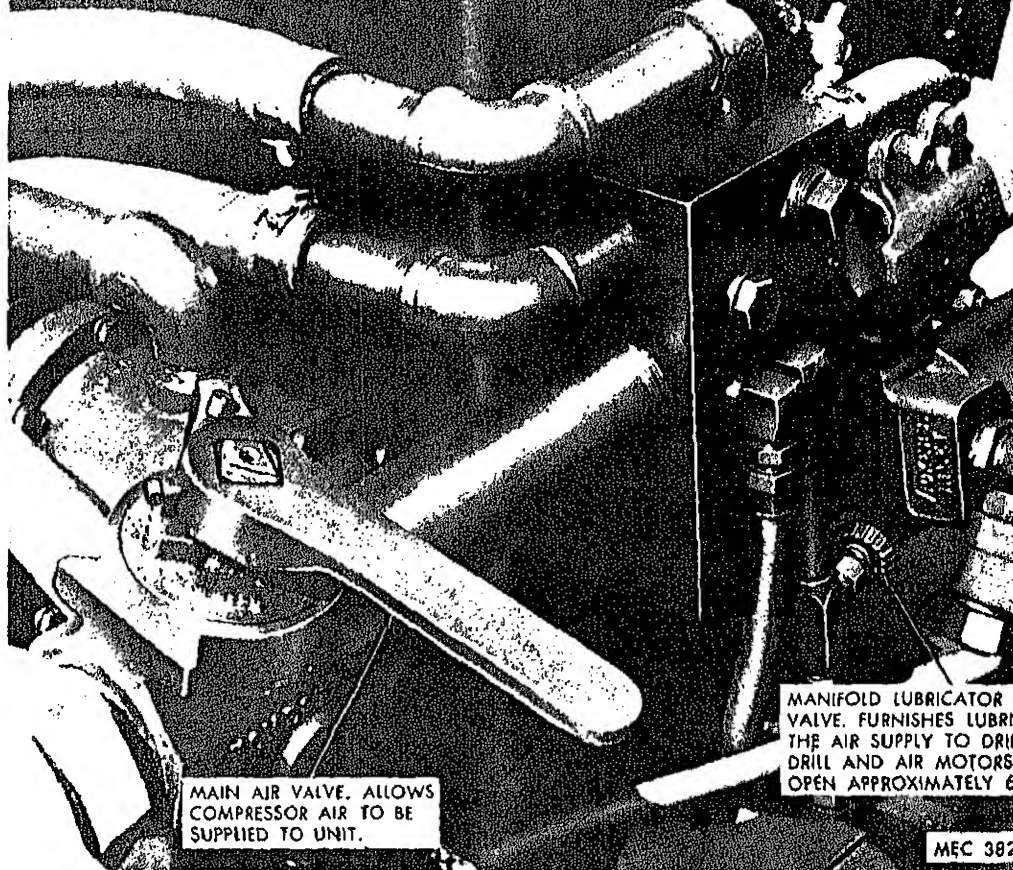


Figure 2-3(4)—Continued.

*d. Drilling.*

- (1) Open the valve on the manifold lubricator (fig. 2-3) by following the procedure:

- (a) Turn the valve handwheel in a clockwise direction until the valve is completely closed.
- (b) Open the valve six complete turns by turning the handwheel in a counterclockwise direction.

- (c) Start the drill. After a few minutes check to see if the following condi-

2. A bluish oil mist in the drill exhaust.

If the above conditions exist, the needle valve requires additional adjustment.

- (d) To increase the flow of air, turn the needle valve handwheel counterclockwise.
- (e) To decrease the flow of air, turn the needle valve handwheel clockwise.

- lubricator for oil, and connect main air line. If drill is new, remove air hose at drill and turn on air supply when oil vapor emerges from hose. Reconnect hose to drill.
- b) Install drill steel & bit in drill and close centralizer arms above bit.
  - c) Position drill guide to the desired drilling location. Extend the power guide extension cylinder until the foot piece is firmly against the drilling face.
  - d) Turn drill blow control on, use the feed motor control to move drill until bit is just above rock. Put rotation control in forward. Turn on drill control to rotate bit slowly. Feed bit down into rock and collar hole.
  - e) After collaring hole, turn drill control on full and adjust feed to allow steel to rotate freely.
  - f) After hole is bottomed, shut off drill. Use the drill blow control to clean out hole. After hole is cleaned, shut off all air blow, and retract drill steel from hole.
  - g) If needed, add another drill steel to deepen hole or move drill to next position for new hole as required and repeat cycle.

#### *Adding Extension Rods.*

- a) Shut off the drill control at the remote control manifold.
- b) Use the feed control to retract the drill to free the bit from the bottom of the hole.
- c) Place the ROTATION control in the neutral position to stop rotation.

**Caution:** The drill power can be used to loosen couplings but this pro-

- ceeds on the shank piece.
  - (6) Shut off the DRILL control.
  - (7) Place the ROTATION selector in the reverse position.
  - (8) Use the FEED control to raise the drill, allowing the shank piece to drop clear of piston action. Keep the shank piece clear of hammer range when using reverse rotation to unscrew threads. Threads can be damaged by the hammer blows when not in full contact.
  - (9) Operate the DRILL control at part throttle to unscrew the shank piece from the coupling.
  - (10) Shut off the DRILL control.
  - (11) Retract the drill to the top of the drill guide.
  - (12) Lubricate the threads at both ends of the coupling.
  - (13) Screw a coupling on one end of the extension rod by hand.
  - (14) Align the extension rod and coupling with the shank piece and screw the other end into the coupling resting on the centralizer.
  - (15) Screw the coupling to the shank piece by hand, as tightly as possible.
  - (16) Place the ROTATION selector in the conventional (left-hand) rotation position, and operate the DRILL control at part throttle to tighten up the extension rod at both ends.
- Caution:** Do not use the hammer control to tighten parts since damage to threads on the shank piece and extension rod may occur if the shank piece is struck before the threads are in full contact.
- (17) Repeat the entire procedure for each extension rod added.

d. Use the FEED control to lower the drill, and hold the bit at the bottom of the hold under normal feed pressure.

e. Move the DRILL control on and off in short bursts until the coupling is loose on the shank piece.

f. Shut off the DRILL control.

g. Place the ROTATION selector in the reverse position.

h. Open the centralizer arms and feed the drill up the drill guide.

i. Stop the drill feed when the coupling clears the top of the centralizer.

j. Close the centralizer arms and feed the drill down until the coupling rests on top of the centralizer.

k. Operate the DRILL control at part throttle to unscrew the drill steel from the coupling resting on the centralizer, and the coupling on the shank piece.

l. Stop rotation and feed the drill down the drill guide until the shank piece engages the coupling resting on the centralizer.

m. Place the ROTATION selector in the conventional (left-hand) rotation position and screw the shank piece into the coupling. Do not screw the joint tight.

n. Repeat the procedure to remove successive sections of drill steel.

o. Shut off the main air valve and disconnect the bull hose if operation is complete. Shut off the compressor.

p. Perform the necessary daily preventive maintenance services (para 3-6).

## 2-13. Operation Under Usual Conditions

a. Start the pneumatic drill as described in paragraph 2-11a.

b. Operate the pneumatic drill as described in paragraph 2-11b through 2-11e.

**Warning:** Wear a respiratory mask at all times during drilling operations, to prevent

a. Keep lubricating oil reservoir full at all times to prevent moisture condensation in the lines.

b. Use grade OES lubricant for improved performance in cold weather.

c. Be sure the compressor is warmed up before drilling.

d. Avoid sharp bends in the lines. Bend them with care. They may become brittle at extreme temperatures.

e. Check all exhaust ports for frost formation. Defrost as necessary.

**Warning:** Do not touch the metal surfaces with bare hands. They become extremely hot to the metal surfaces at extreme temperatures.

## 2-15. Operation in Extreme Cold

a. Where possible, take advantage of natural barriers to keep the unit out of the sun.

b. Inspect hoses frequently for deterioration due to excessive cold.

## 2-16. Operation in Dusty or Sandy Conditions

a. Shield the unit from direct sunlight. Use a cage of natural barriers which will protect it from blowing sand or dust.

b. Strain lubricating oil and air before adding to the manifold. Clean the hydraulic reservoir, respectively the air receiving vessels are clean, and take care to avoid dust or grit getting in the lines during refilling process.

c. Blow all air hoses out before connecting them to the pneumatic drill.

d. Take extra care to make sure the air is emerging from the drill during drilling operations.

e. Between operating periods, cover the tire unit if possible or seal the unit with cloth or tape.

## **Operation in Salt Water Areas**

Avoid contact with salt water as much as possible since it is highly corrosive. Wash with fresh water to remove salt.

Exercise extreme care to prevent salt water particles from entering lubricant reservoirs, as salt retards the rust preventive and increases the corrosive effect of moisture.

Paint exposed metallic surfaces if paint has been chipped off or otherwise removed. Coat exposed ferrous metal surfaces with

internal parts.

## **2-19. Operation at High Altitudes**

Since air pressure decreases with increasing altitude, the following air consumption multipliers are provided for various altitudes in order that the compressor output can be readjusted. The following are based on a multiplier of 1.000 at sea level (0 feet).

- a. 1,000 ft; multiplier 1.032
- b. 2,000 ft; multiplier 1.065
- c. 5,000 ft; multiplier 1.174
- d. 10,000 ft; multiplier 1.391



# CHAPTER 3

## OPERATOR AND ORGANIZATIONAL MAINTENANCE

### INSTRUCTIONS

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#### Section I. SPECIAL TOOLS AND EQUIPMENT

##### 3-1. Special Tools and Equipment

No special tools or equipment are required by operator or organizational maintenance personnel for maintenance of the pneumatic drill.

##### 3-2. Basic Issue Tools and Equipment

Repair parts issued with or authorized for use with the pneumatic drill are listed on the basic issue items list, Appendix A, manual.

#### Section II. LUBRICATION

##### 3-3. General Lubrication Information

For the current lubrication order, LO 5-8820-289-12, refer to DA Pamphlet 810-4 (Military Publications).

##### 3-4. Detailed Lubrication Information

*a. General.* Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Do not allow any dust, dirt, or other foreign matter to come in contact with the lubricants. Keep all lubrication equipment clean and ready for use.

*b. Cleaning.* Keep all external parts that do not require lubrication free of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

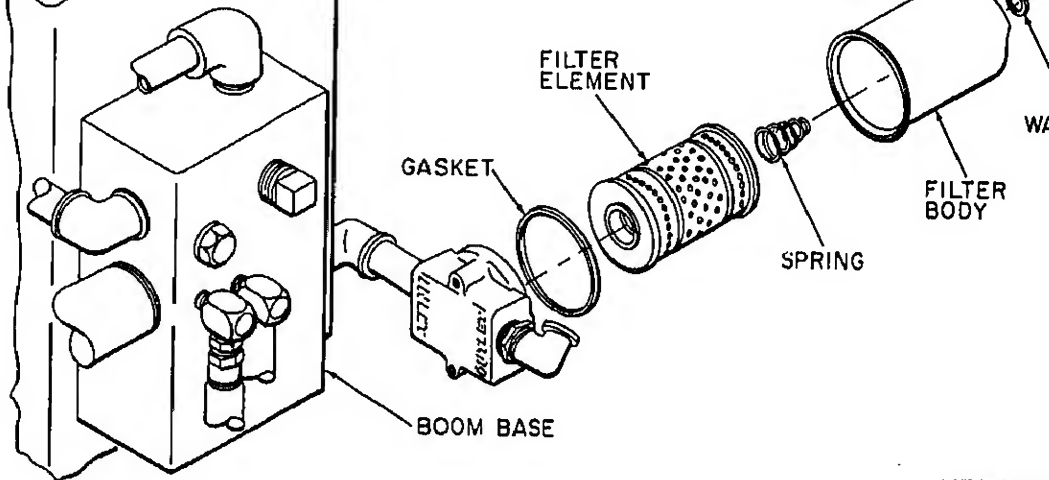
*c. Points of Lubrication.* Service lubrication points at proper intervals as specified on LO 5-3820-239-12.

##### *d. OES Oil.*

- (1) When using grade OES oil under conditions of extreme cold, the oil level frequently, and oil consumption may increase.
- (2) This oil may require changing more frequently than usual because of contamination by dilution and oxidation. Formation will increase under severe weather operation conditions.

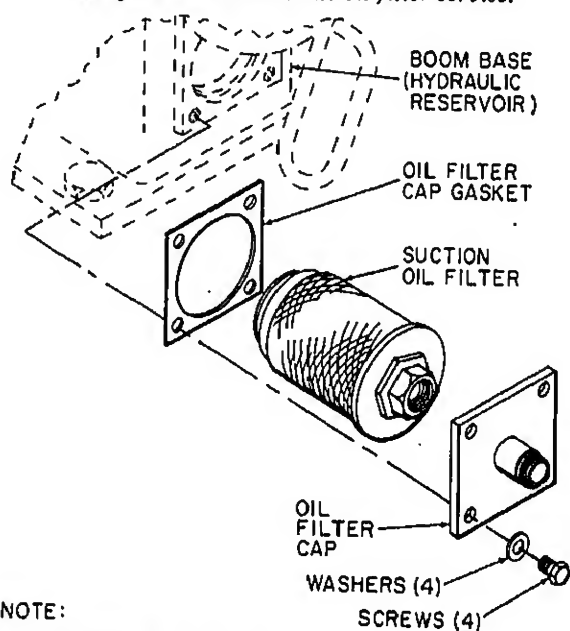
*e. Oil Filter Service.* Refer to figure 3-3 and service the return line oil filter. Refer to figure 3-3 and service the suction oil filter.

*Note.* This service is performed only after cleaning and flushing the hydraulic reservoir. See section VI.



MEC 3820

*Figure 3-2. Return line oil filter service.*



NOTE:

SERVICE AFTER EACH  
1000 HOURS OF OPERATION  
(WHEN FLUSHING RESERVOIR).  
CLEAN FILTER ELEMENT  
WITH APPROVED SOLVENT  
AND BLOW DRY

MEC 3820-239-15/3-3

*Figure 3-3. Suction oil filter service.*

at all times, it must be inspected daily so that defects may be discovered before they result in serious failure. The necessary preventive services to be performed are listed in paragraphs 3-6 and 3-7. Item indicate the sequence of minimum requirements. Defects discovered on operation of the unit shall be noted for correction, to be made as soon as operation is resumed. Stop operation immediately if a defect is noticed which would damage the unit if operation were continued. All defects and shortcomings will be recorded to determine the corrective action taken on DA Form 1 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

### **Preventive Maintenance Services**

Paragraph contains an illustrated tabu-

lated listing of organizational maintenance personnel. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-4 for the daily preventive maintenance services.

### **3-7. Quarterly Preventive Maintenance Services**

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-5 for the quarterly preventive maintenance services.

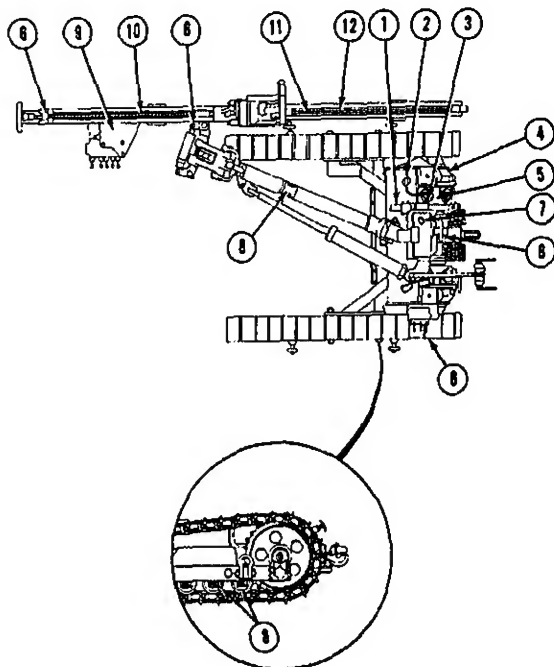


# **PREVENTIVE MAINTENANCE SERVICES DAILY**

TM 5-3820-239-15

INGERSOLL-RAND MODEL  
CMI50A/D475A

PNEUMATIC D



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PA
1	<u>HOSES AND FITTINGS.</u> CHECK HOSES FOR CONDITION. MAKE SURE CONNECTIONS ARE TIGHT.	
2	<u>LUBRICATING OIL RESERVOIR.</u> CHECK OIL LEVEL.	3
3	<u>LUBRICATOR METERING VALVE.</u> ADJUST FLOW TO DRILL.	3
4	<u>TRACTION DRIVE PLANET GEAR HOUSING.</u> CHECK OIL LEVEL.	3
5	<u>PROPELLING AIR MOTORS.</u> CHECK OIL LEVEL.	3
6	<u>LUBRICATION FITTINGS.</u> ADD GREASE TO FITTINGS(ON BOOM, HYDRAULIC CYLINDERS, MAIN FRAME, DRILL GUIDE, POWER DUMP AND SWING ASSEMBLY, AIR FEED MOTOR, CENTRALIZER, POWER GUIDE EXTENSION MOUNTING, PROPELLING CONTROLS, AND TRACK IDLERS). ADD GREASE TO FITTINGS ON HYDRAULIC PUMP (WEEKLY).	
7	<u>HYDRAULIC RESERVOIR.</u> CHECK AND MAINTAIN OIL LEVEL 5 INCHES BELOW TOP OF RESERVOIR (WEEKLY).	3
8	<u>TRACTION UNIT.</u> LUBRICATE ROLLERS AND FITTINGS. CHECK OIL LEVEL IN FINAL DRIVE HOUSING.	3

## Lubricating Oil Reservoir

Disconnect the manifold lubricator air line and remove the pipe plug on top of the manifold lubricator. Remove the pipe plug.

Insert a clean dipstick and check the level in the lubricating oil reservoir.

Fill with the prescribed oil as often as necessary.

**Note:** Do not allow the unit to run without oil in the reservoir. This oil furnishes the lubrication to the drifter drill and air motors, and lack of lubrication will cause these parts to wear prematurely.

Normally, if the reservoir is filled at the beginning of the day, the drill should operate for several hours without refilling.

## Lubricator Metering Valve Setting

Turn the metering valve handle (fig. 3-11) counterclockwise until completely closed.

Turn the valve (counterclockwise rotation) through one complete revolution.

Start the drill. After several minutes, stop the drill to see that the following conditions exist:

a. Oil droplets are visible on the drill shank piece.

b. A bluish oil mist or haze is apparent in the exhaust.

If the above conditions do not exist, or if too much oil is flowing, readjust the valve as follows: (counterclockwise rotation allows more oil to flow; clockwise rotation decreases flow of oil).

**Note:** Do not operate the drill with the metering valve closed. The oil furnishes the lubrication to the drifter drill and the air motors, and lack of lubrication will cause

wear of the motor case cover. Thus, although there is no direct check of the oil level in the traction drive planetary gear housing, the level must be the same as that in the propelling air motor. Proceed as follows.

a. To check the oil level in the propelling air motors, remove the pipe plug located 1/3 of the way up from the bottom of the motor case (fig. 3-6). If oil flows from this port, the level is sufficient for both the propelling air motors and the traction drive.

b. If it is necessary to add oil, leave the pipe plug off and remove the vent cap at the top of the case. Add the prescribed lubricating oil through the vent cap port until it flows from the pipe plug port. Install the pipe plug and the vent cap.

c. When necessary to drain the oil from the traction drive planetary gear housing and propelling air motor, remove the magnetic plug and pipe plugs at the bottom of each housing and allow all of the oil to drain off. Clean and install the plugs and refill through the vent cap port (b above).

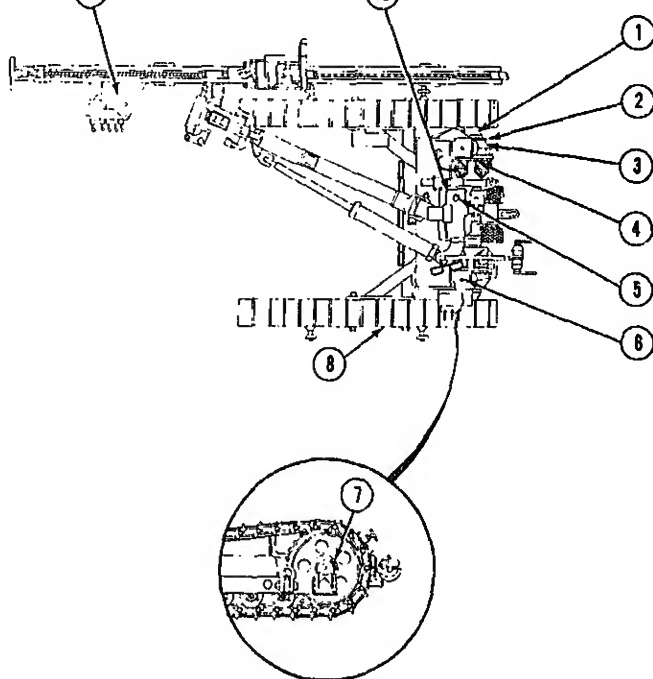
## 3-12. Checking Oil Level in Hydraulic Reservoir

a. Remove the vent cap from the hydraulic reservoir.

b. Insert a clean dipstick into the reservoir and check the level of oil. The level should be 5 inches below the top. This allows room for oil return during operation.

**Note.** If the unit is new or the system was drained, make sure oil is distributed throughout the closed system by turning on the hydraulic pump and operating the boom cylinders through use of the hydraulic valve. Recheck the oil level after operation, and refill if necessary.

c. Add the prescribed oil if necessary through the vent cap port, until the level is 5

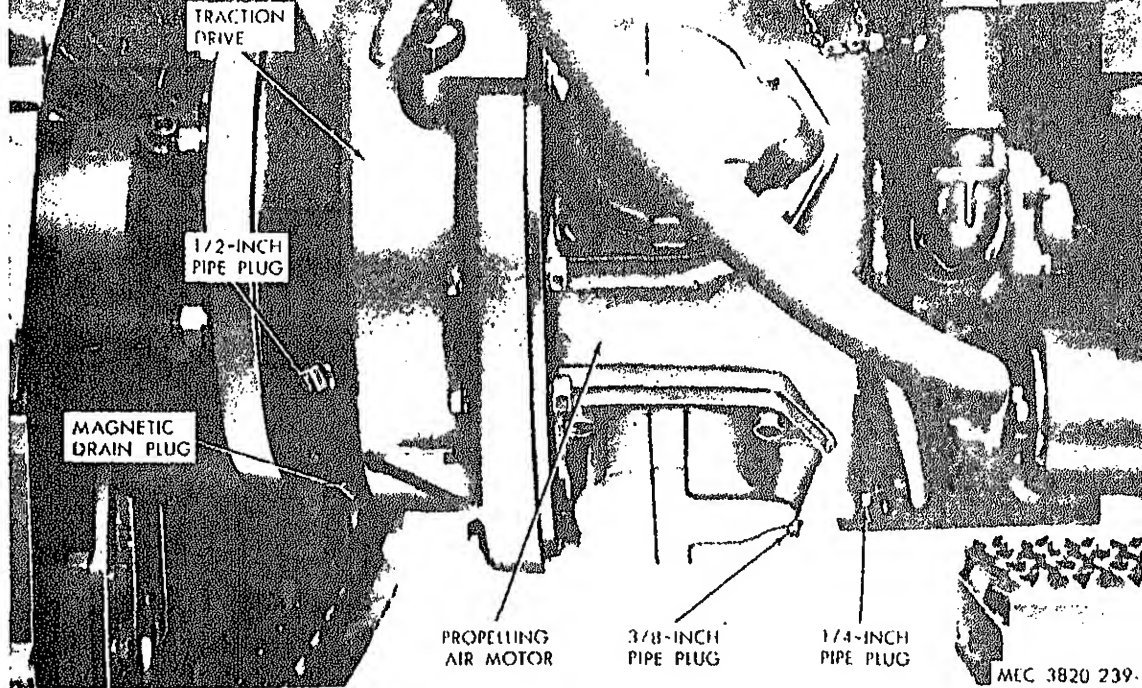


LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM

1	<u>FINAL DRIVE</u> . DRAIN OIL AND REFILL (500 HOURS).
2	<u>MAGNETIC PLUGS</u> . CLEAN AND INSPECT (1000 HOURS).
3	<u>TRACTION DRIVE</u> . DRAIN OIL AND REFILL PLANET GEAR HOUSING(500 HOURS)
4	<u>PROPELLING AIR MOTORS</u> . DRAIN OIL AND REFILL (500 HOURS).
5	<u>HYDRAULIC RESERVOIR</u> . REMOVE AND CLEAN SUCTION OIL FILTER. DRAIN, FLUSH, AND REFILL RESERVOIR (1000 HOURS).
6	<u>BRAKES</u> . ADJUST BRAKES
7	<u>FINAL DRIVE SPROCKETS</u> . CHECK AND TIGHTEN SPROCKET STUD NUTS IF REQUIRED.
8	<u>TRACKS</u> . CHECK AND ADJUST TRACK IF REQUIRED.
9	<u>AIR FEED MOTOR</u> . DRAIN TRANSMISSION OIL IN WORM HOUSING. REFILL (500 HOURS).
10	<u>RETURN LINE OIL FILTER</u> . REPLACE FILTER CARTRIDGE (1000 HOURS).

MEC 3820



*Figure 3-6. Lubrication of traction drive and propelling air motors.*

*Note.* Since the hydraulic system is a closed system, there should never be need to add a significant amount of oil. Should frequent refilling be required, inspect carefully for leaks or defective seals and components. See figure 1-5 for a complete hydraulic piping diagram.

### 3-13. Lubricating Traction Unit

a. Clean the oil fittings on the track rollers, rear sprocket shaft, and front wheel support of each traction unit (fig. 3-7).

*Note.* If the pneumatic drill is standing or operating in mud or water, clean and oil the fittings every 4 hours instead of every 8 hours.

b. Using an oil gun, fill each fitting until oil is forced out through the seals.

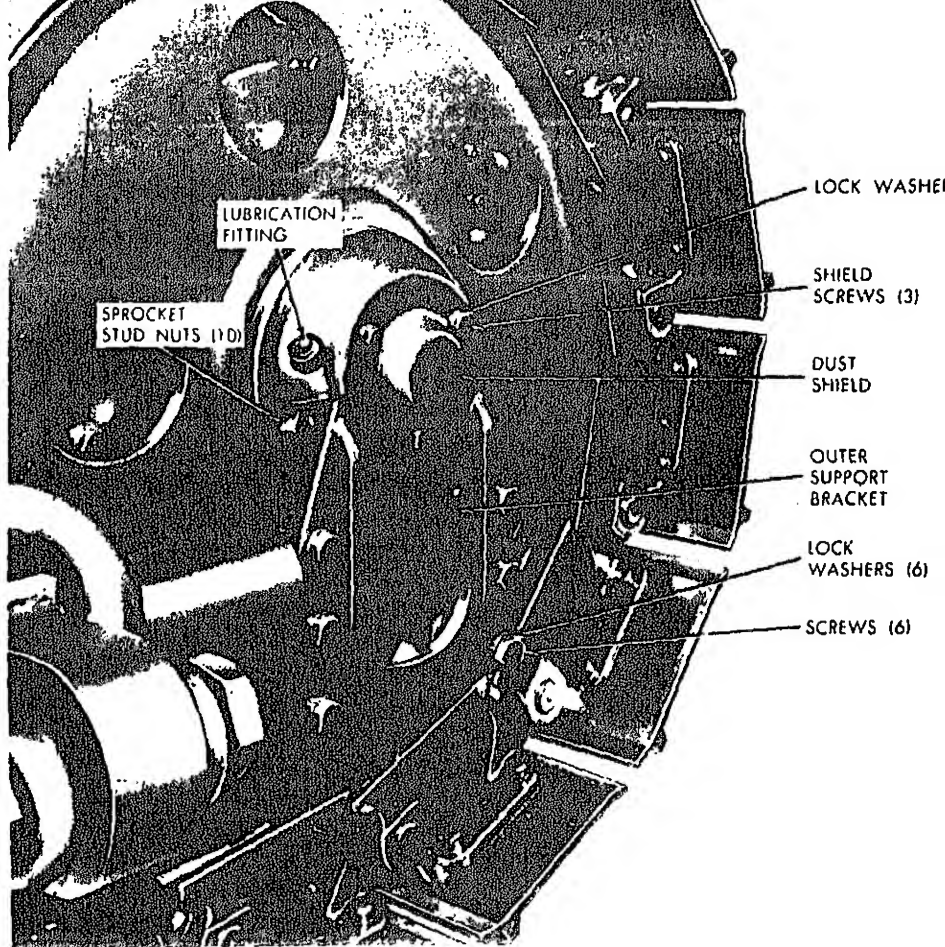
c. To check the oil level in the final drive housing, remove the oil level plug near the bottom of each drive (on the inner side of the rear sprocket) (fig. 3-8).

d. If it is necessary to add oil, remove the filler plug at the top of the final drive (fig. 3-8). Add the prescribed oil until it flows from the oil level plug port. Install the oil level plug and the fill plug.

e. When necessary to drain the oil from the final drive housing, remove the magnetic drain plug from the bottom of each housing (fig. 3-8) and allow all of the oil to drain out. Clean and install the drain and level plugs. Refill through the fill plug port (d). When refilling, note that the capacity of each drive housing is 1 1/2 pints of oil.

### 3-14. Lubricating Air Feed Motor

a. Remove the worm housing plug from the top of the air feed motor (fig. 3-9) and



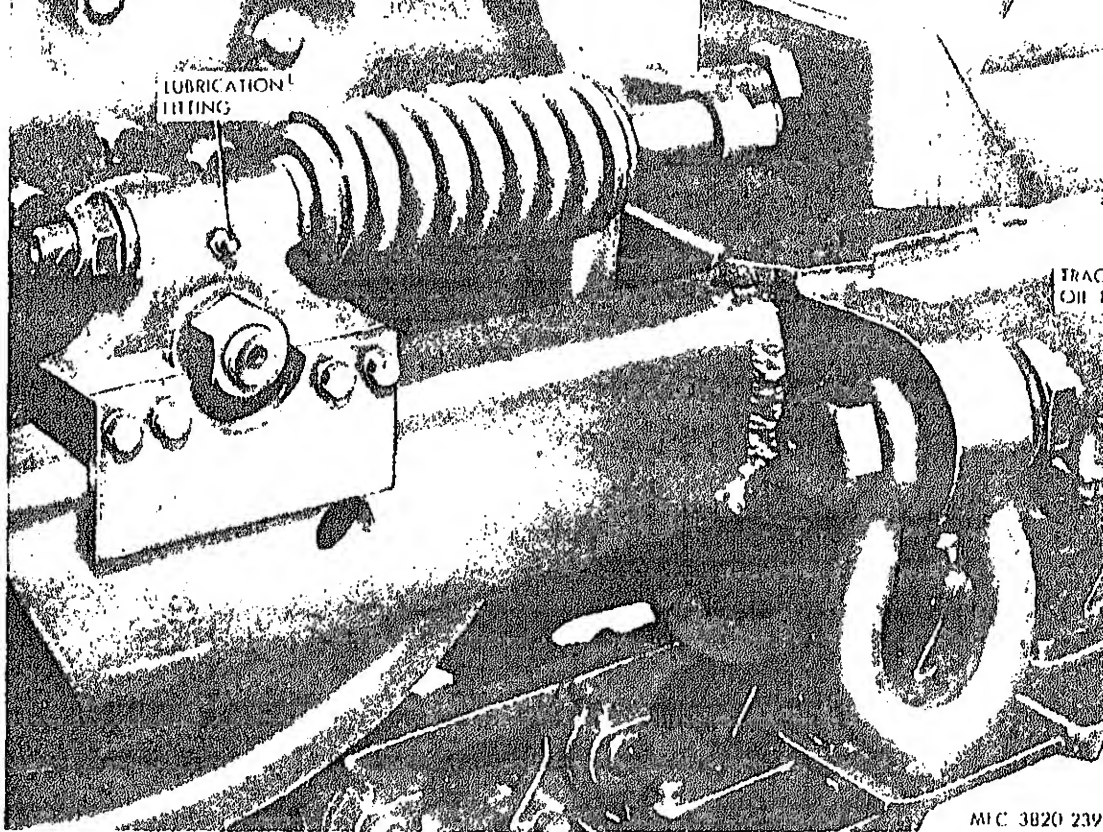
*Figure 3-7(1). Lubrication of traction unit.*

the prescribed lubricating oil to replenish the supply.

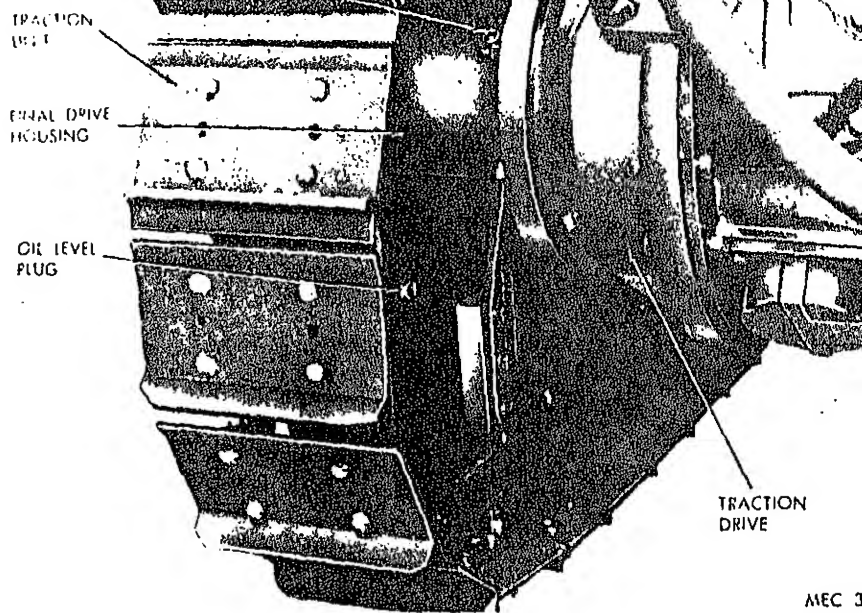
b. Remove the grease plug from the side of the air feed motor cylinder case and add 2 to 3 ounces of the prescribed grease.

c. When necessary to drain the oil from the air feed motor worm housing, position the

drill guide so that the air feed motor is pointed down, and remove the worm housing. Remove the two pipe plugs from the top of the housing to allow all of the oil to drain out. Position the drill guide in the top of the housing and refill through the worm housing (a above).



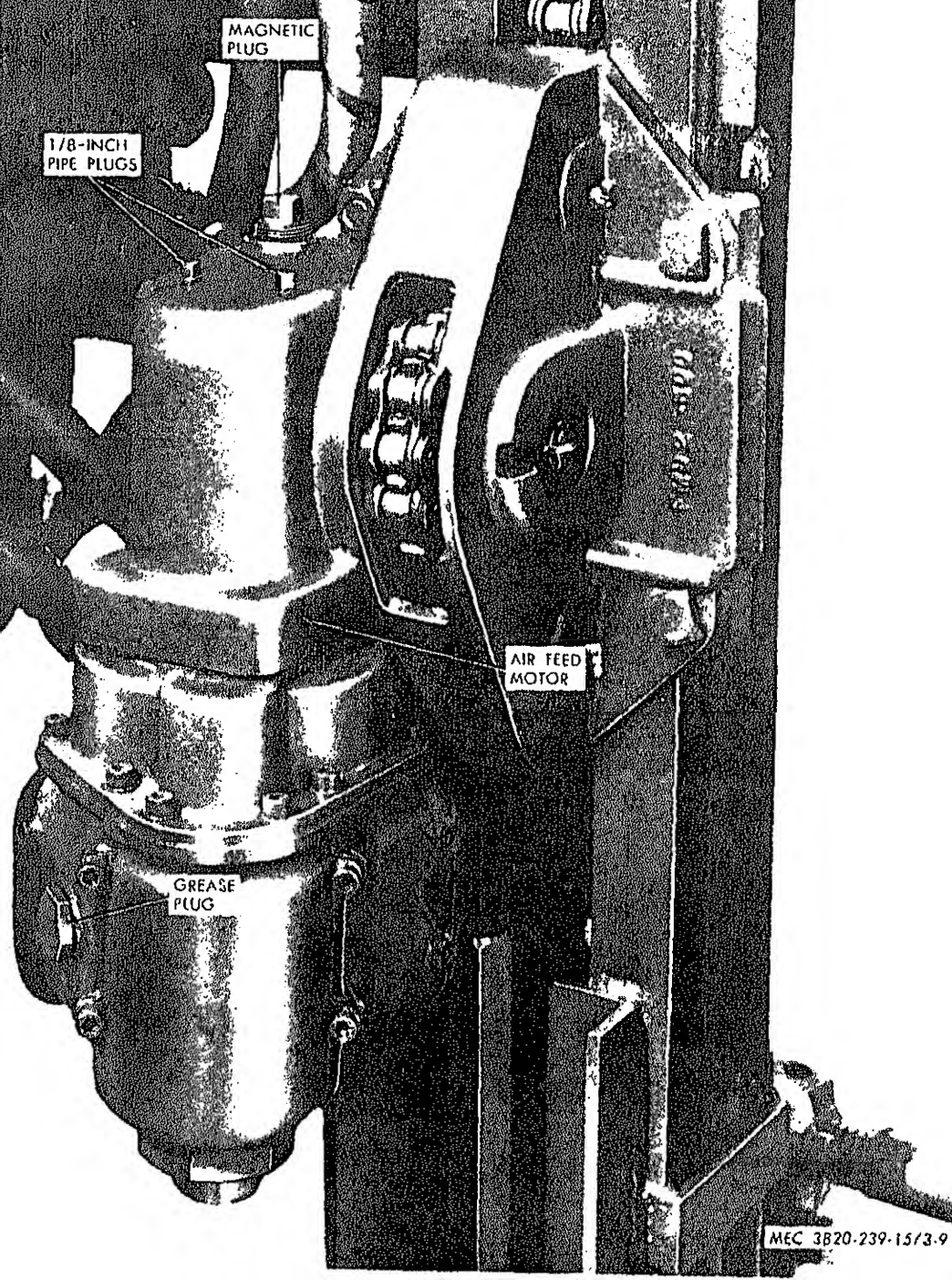
*Figure 3-7(2)—Continued.*



MEC 3

*Figure 3-8. Lubrication of traction unit final drive housing.*





MAGNETIC  
PLUG

1/8-INCH  
PIPE PLUGS

AIR FEED  
MOTOR

GREASE  
PLUG



diagnosing and correcting immediately operation or failure of the pneumatic drill. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

### 3-16. No Hydraulic Pressure in System

Probable cause	Possible remedy
Insufficient air supply to hydraulic pump air motor.	Check hoses and fittings for leakage.
Throttle valve closed	Open throttle valve.
Hydraulic pump coupling loose or damaged.	Inspect and tighten or replace.
Hydraulic pump or air motor damaged.	Replace pump or air motor (para. 8-48).
Hydraulic lines clogged	Check suction filter and hydraulic reservoir for dirt and sludge. Drain, flush and refill if necessary (para. 8-28).
Hydraulic oil level low	Check hydraulic reservoir (para. 8-12) and fill if necessary. Inspect for leaks.

### 3-17. Drifter Drill Inoperative

Probable cause	Possible remedy
Air feed motor connections loose or damaged.	Check hoses and fittings for leakage.
Air feed motor not being properly lubricated.	Check level in lubricating oil reservoir. Refill if required (para. 8-9).
Feed chain broken or damaged.	Inspect, clean, and lubricate feed chain (para. 8-27).
Air feed motor damaged	Disassemble and inspect (report this condition to direct support maintenance).
Remote control manifold damaged.	Disassemble and inspect (report this condition to direct support maintenance).
Drifter drill binding or damaged.	Disassemble and inspect (report this condition to direct support maintenance).

### 3-18. Hydraulic Valve Operating Improperly

Probable cause	Possible remedy
Excessive leakage around boss fittings.	Tighten hoses. Replace and inspect damaged O-rings. Report this condition to direct support maintenance).
Fluttering action due to plugged return line.	Inspect return line. Replace cartridge if necessary. Drain and flush hydraulic reservoir if necessary.
Levers do not operate smoothly.	Disassemble and inspect spools, springs, and handles (report this condition to direct support maintenance).
Erratic system pressure	Clean relief valve. Inspect hydraulic valve (report this condition to direct support maintenance).

### 3-19. Boom Operates Improperly

Probable cause	Possible remedy
Oil leakage in hydraulic cylinders.	Replace cylinder (para. 8-46).
Excessive clearance between cylinder head and rod.	Replace rod pin. Report this condition to direct support maintenance).
Boom drifts due to cylinder leakage.	Replace cylinder (para. 8-46).

### 3-20. Traction Unit Brakes Inoperative

Probable cause	Possible remedy
Brakes need adjustment	Adjust brakes (para. 8-88).
Air hoses to brakes improperly connected or damaged.	Inspect hoses and connections (report this condition to direct support maintenance).
Brakes damaged	Disassemble and inspect (report this condition to direct support maintenance).

## Reaction Unit Operates Improperly

Possible cause  
Booms do not ro-

Possible remedy  
Check for wedged objects  
and lubricate rollers  
(para. 8-18).

Improper lubrication -----

Check oil level in propelling air motors and lubricating oil reservoir. Lubricate fittings (para. 8-18).

## Section VI. HYDRAULIC RESERVOIR

### General

Hydraulic reservoir stores and provides hydraulic oil to operate the boom and guide rollers, as a result of operation of the hydraulic valve. The reservoir is an integral part of boom base assembly.

### Servicing Procedure

Remove the vent cap from the top of the reservoir.

Remove the magnetic plug from the bottom of the boom base assembly.

Allow the oil to drain off.

The reservoir holds 10 gallons of oil. Provide a suitable container to collect the runoff.

Remove the suction oil filter (fig. 3-8), clean it with an approved solvent, and blow dry with compressed air.

Install the suction oil filter with a new gasket and vent cap gasket.

f. Clean the magnetic plug and install on the drain adapter at the bottom of the hydraulic reservoir.

g. Remove and discard the return line oil filter cartridge (fig. 3-2). Clean the body and other parts with an approved solvent and install a new filter cartridge.

h. Add the prescribed oil until the level is within 5 inches of the top of the reservoir. Install the vent cap.

i. Operate the booms with the hydraulic valve to make sure oil is flowing throughout the system.

j. Remove the vent cap and recheck the oil level with a clean dipstick. Add oil if necessary to bring the level up to within 5 inches of the top.

**Caution:** Do not overfill. The reservoir must allow for return of oil during operation.

## Section VII. FEED CHAIN

### General

Feed chain passes over sprockets at each end of the drill guide, and over idler wheels between driving sprockets in the air feed motor. Feed chain transmits power from the air feed motor worm-gear to the drifter drill for moving up and down the drill guide.

### Adjustment

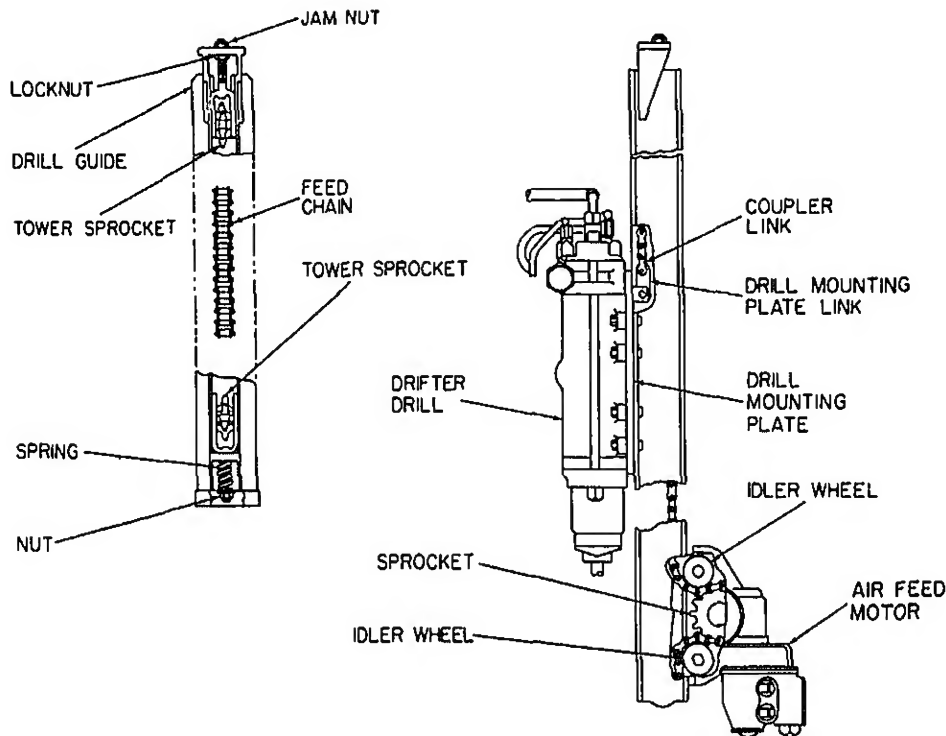
Make the adjustment of the feed chain by pulling against the rollers at a point approximately midway up the drill guide (fig. 3-10). When adjustment is proper, the chain will de-

**Note.** A new feed chain has a tendency to stretch and should be checked frequently.

a. Back off the nut on the bottom of the drill guide (fig. 3-10) until the spring is loose.

b. Tighten the bottom nut until the spring (fig. 3-10) just begins to compress (approximately 1/8 inch).

c. Loosen the jam nut on the top of the drill guide (fig. 3-10) and adjust the locknut until the feed chain tension is correct. Tighten the jam nut.



MEC 3820-239-15/3-10

**Figure 3-10. Adjustment and removal of feed chain.**

b. Disconnect the feed chain coupler links (fig. 3-10) from the drill mounting plate links by removing the cotter pins and the link side plates.

c. Lift the feed chain off the tower sprockets and carefully remove it from the air feed motor sprocket and the drill guide.

### 3-27. Cleaning and Inspection

a. Clean the feed chain with approved solvent. Dry thoroughly.

b. Inspect the feed chain carefully for broken links. Repair or replace as necessary.

c. Coat the feed chain with oil to prevent rust.

### 3-28. Installation

a. Loop the feed chain around the tower sprocket (fig. 3-10) on the drill guide.

b. Carefully thread the chain under the idler wheel, around the sprocket, and over the bottom idler wheel in the air feed motor (fig. 3-10).

**Caution:** Make sure the feed chain engages properly with the sprocket to avoid binding.

c. Thread the feed chain around the lower tower sprocket (fig. 3-10) and connect the coupler links to the drill mounting plate links. Install the cotter pins in the coupler links. Bend the ends over to secure the side plates.

ighten the ends of the cotter pins  
(1) and remove the pins.

See figure 3-11 and install the centralizer.

## Section IX. DRIFTER DRILL

### General

A drifter drill is an air-operated drill lub-  
ricated by rock drill oil which is injected into  
the drill stream from the lubricating oil

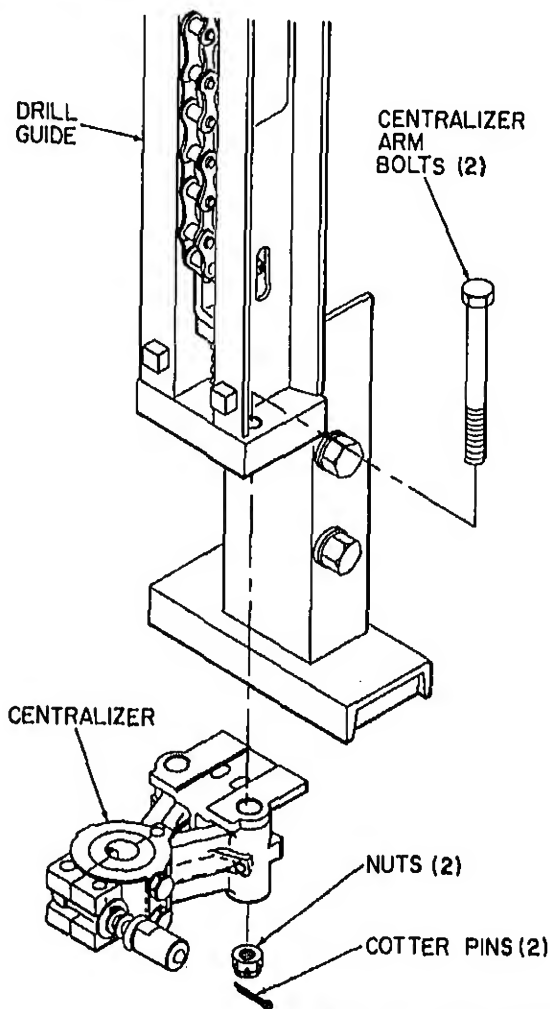
### Removal

Disconnect the air hoses from the drifter

Loosen the drill mounting plate clamp  
nuts (fig. 3-12) and remove the  
drill from the drill guide.

### Installation

See figure 3-12 and install the drifter drill  
mounting plate.



MEC 3820-239-15/3-11

Figure 3-11. Removal of centralizer.

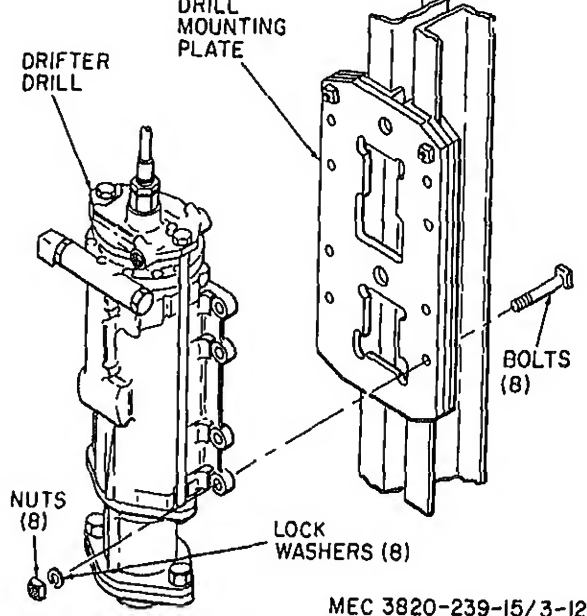


Figure 3-12. Removal of drifter drill.

## Section X. TRACTION UNIT

### 3-35. General

The traction unit provides the propelling motion for the unit. The only work authorized at organizational level is the checking and adjustment of the tracks, and tightening sprocket stud nuts if required.

### 3-36. Servicing

#### a. Track Adjustment.

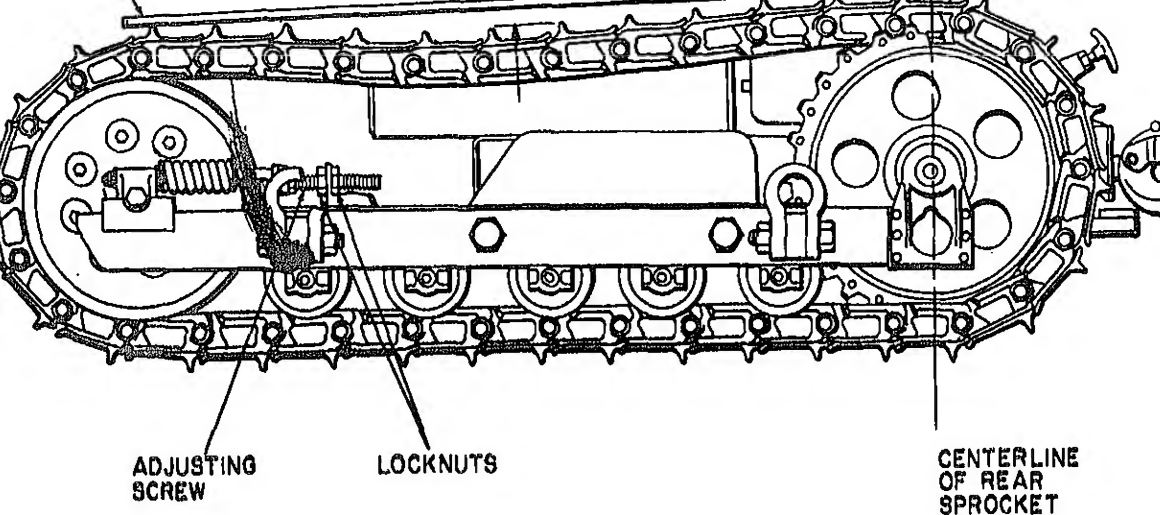
- (1) Propel the pneumatic drill until the center of a grouser is directly over the centerline of the rear wheel sprocket (fig. 3-13).
- (2) Lay a straightedge across the track so that it rests on the grousers over both the front and rear wheels.
- (3) Check the dip at the midpoint between wheels (fig. 3-13). The correct adjustment is 2 inches from the bottom of the dip.

- (4) If the adjustment is not correct, the unit drifts to one side while tramming, adjust the track by loosening one of the adjustment locknuts and tightening the other using the track adjustment wrench. When the adjustment is correct, tighten the locknut.

#### b. Sprocket Stud Nuts.

*Note.* When the unit is new, it is essential that the sprocket stud nuts be tightened after approximately 100 hours of use. After the initial check, annual rechecking is required.

- (1) Remove the dust shield from the support bracket (fig. 3-14) and the traction unit rear sprocket.
- (2) Using a torque wrench, tighten the 10 sprocket stud nuts to 150 foot-pound.



MEC 3820-239-15/

*Figure 3-13. Track adjustment.*

## Section XI. AUTOMATIC BRAKES

### 3-37. General

The automatic brakes used on the pneumatic drill operate independently of each other. Each brake is designed to be normally on, thus preventing accidental movement. When the propelling controls are used, some of the air to the propelling air motors is directed to the brake (fig. 1-3), thus releasing it. During towing, the brake can be manually released by turning in (clockwise) the setscrew at the top of each brake housing.

### 3-38. Brake Adjustment

There is no method of checking the brake adjustment without actually making the adjustment. Unless a trouble is encountered during operation which pinpoints the brakes as the trouble source, perform the adjustment only

when specified during preventive maintenance services.

a. Remove the screws, nuts, and lock washers holding the brake cylinder cover (fig. 3-14).

b. Lift off the brake cylinder cover and the brake cylinder gasket.

c. Screw two 5/8-inch coarse thread screws into the holes in the top of the brake piston and remove the piston from the cylinder.

**Caution:** Be careful not to damage the brake piston O-ring.

d. Using a 1 1/4-inch socket wrench, turn the brake bolt until the working length of the brake spring (measured from the bottom of the cylinder to the top of the brake spring) is 1/2 inches (fig. 3-14).

e. See figure 3-14 and install the parts

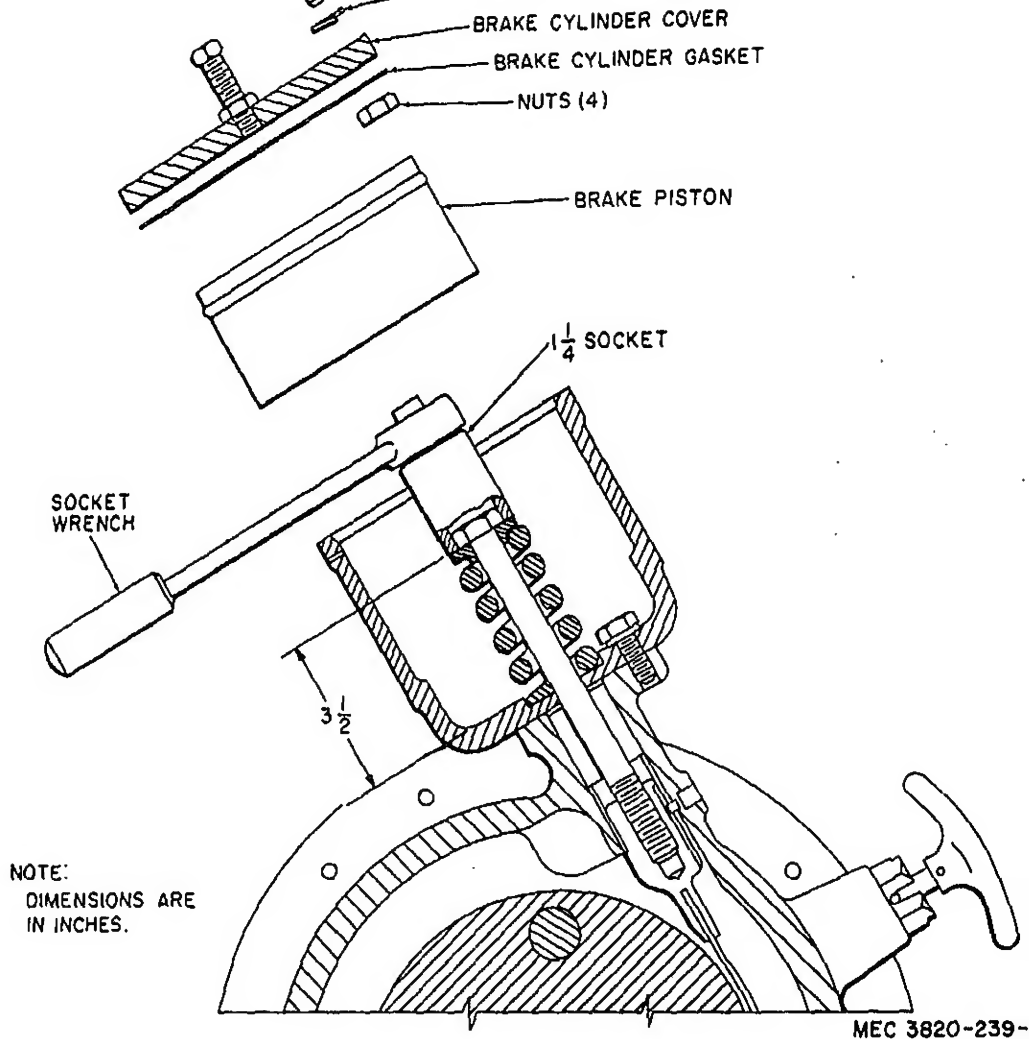


Figure 3-14. Brake adjustment.

## Section XII. TOW HITCH

### 3-39. General

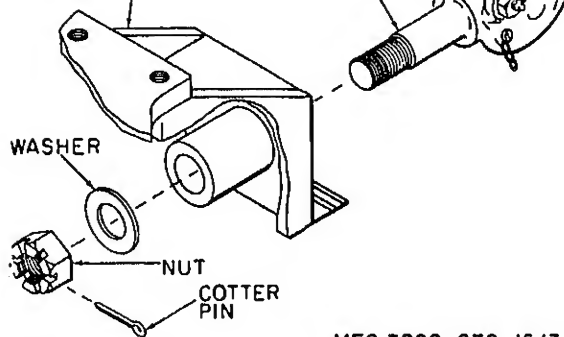
The tow hitch is a swivel-type hitch mounted at the rear of the frame (fig. 1-2). It may be used to couple the compressor to the unit, or to connect to a truck or tractor when towing.

### 3-40. Removal

b. Remove the nut and washer at the tow hitch.

### 3-41. Installation

See figure 3-15 and install the



MEC 3820-239-15/3-15

*Figure 3-15. Removal of tow hitch.*

### Section XIII. HYDRAULIC PUMP ASSEMBLY

#### 42. General

The complete hydraulic pump assembly consists of a hydraulic pump air motor, a flexible coupling, and a hydraulic pump. The air motor drives the pump and furnishes all hydraulic power to the hydraulic valve for operation of the hydraulic cylinders (fig. 1-5).

#### 43. Removal

- a. Disconnect all hoses and fittings.
- b. Remove the four nuts, lock washers, and bolts (fig. 3-16) and separate the complete hydraulic pump assembly from the boom base.

*Note.* If necessary to replace only the air motor, flexible coupling, or hydraulic pump, follow the required procedures given below.

- c. Loosen the setscrew on either side of the flexible coupling, depending on which unit is to be removed.

- d. Remove the two nuts, lock washers, bolts securing the hydraulic pump to the pump housing (fig. 3-16), and remove the hydraulic pump with or without the flexible coupling.

- e. Remove the eight bolts and lock washers securing the hydraulic pump air motor to the pump housing (fig. 3-16), and remove the air motor.

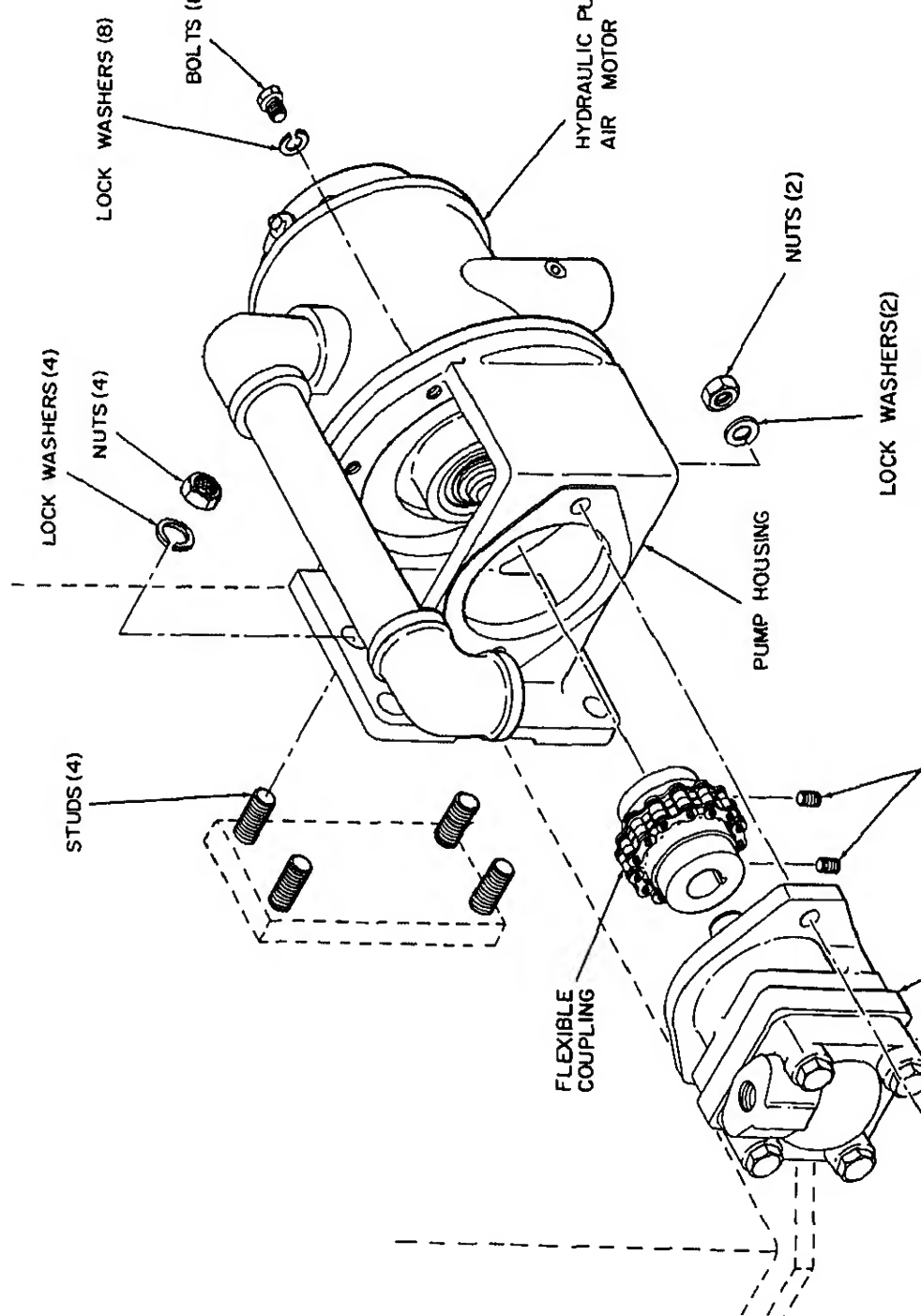
- f. Loosen the remaining setscrew on the flexible coupling and separate the flexible coupling from the shaft.

#### 3-44. Installation

- a. See figure 3-16 and install the hydraulic pump parts.

- b. See figure 1-5 and connect the hoses and fittings.





the hydraulic cylinders used on the pneumatic drill are all essentially identical in operation and design. The two cylinders used on the hydraulic boom assembly (boom swing and boom lift) (fig. 1-1) control the boom position horizontally and vertically. The two cylinders used on the power dump and swing assembly (swing and dump) (fig. 1-1) control the position of the drill guide. The remaining cylinder is a part of the power guide extension mounting (fig. 1-1). The extension cylinder raises the drill guide up and down within the limits of the extension mounting.

## **5. Removal**

*General.* See figure 1-5 and disconnect

moved.

*b. Hydraulic Boom Cylinders.* See figure 3-17 and remove the boom swing cylinder and the boom lift cylinder.

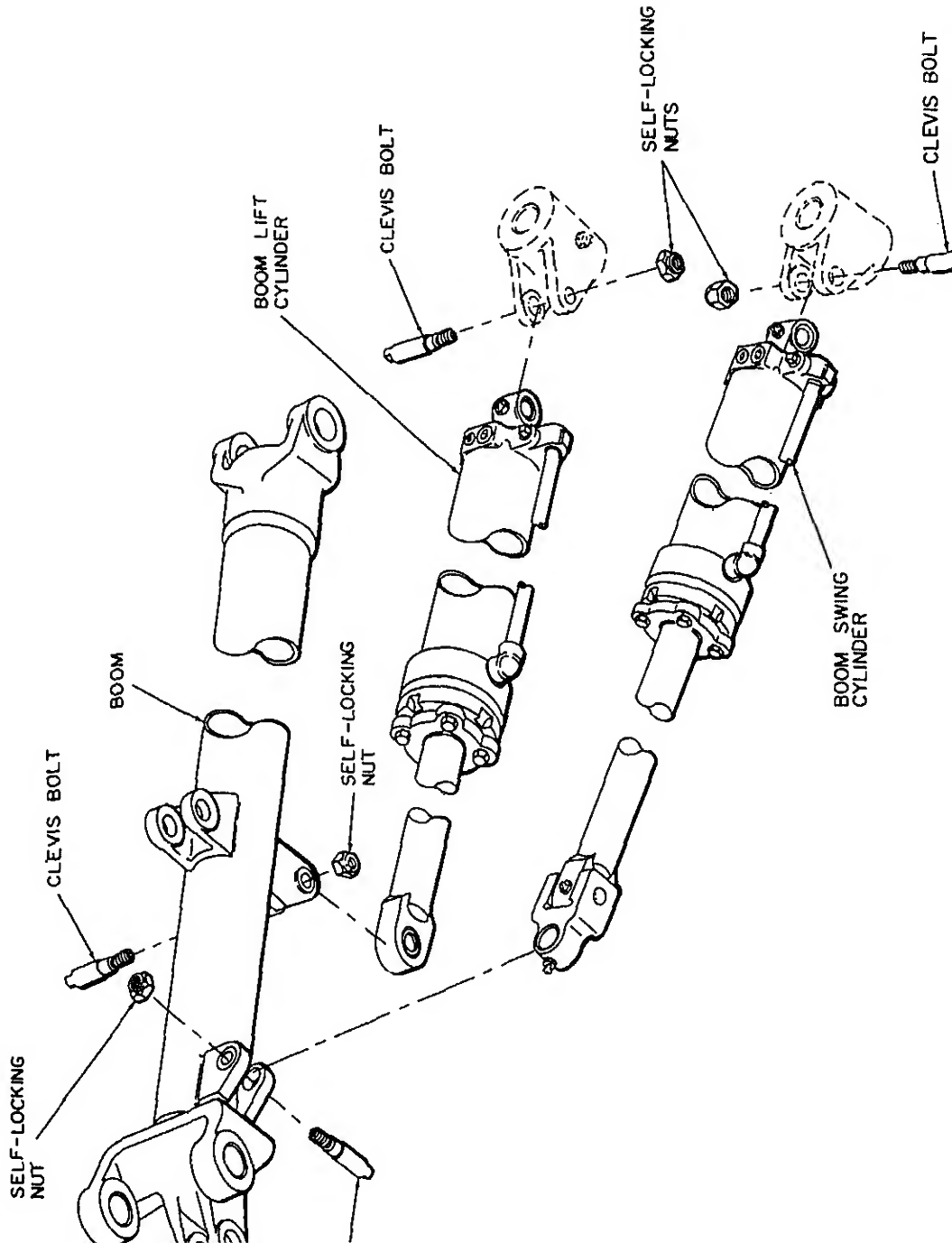
*c. Power Dump and Swing Cylinder.* See figure 3-18 and remove the dump cylinder and the swing cylinder from the power dump and swing assembly.

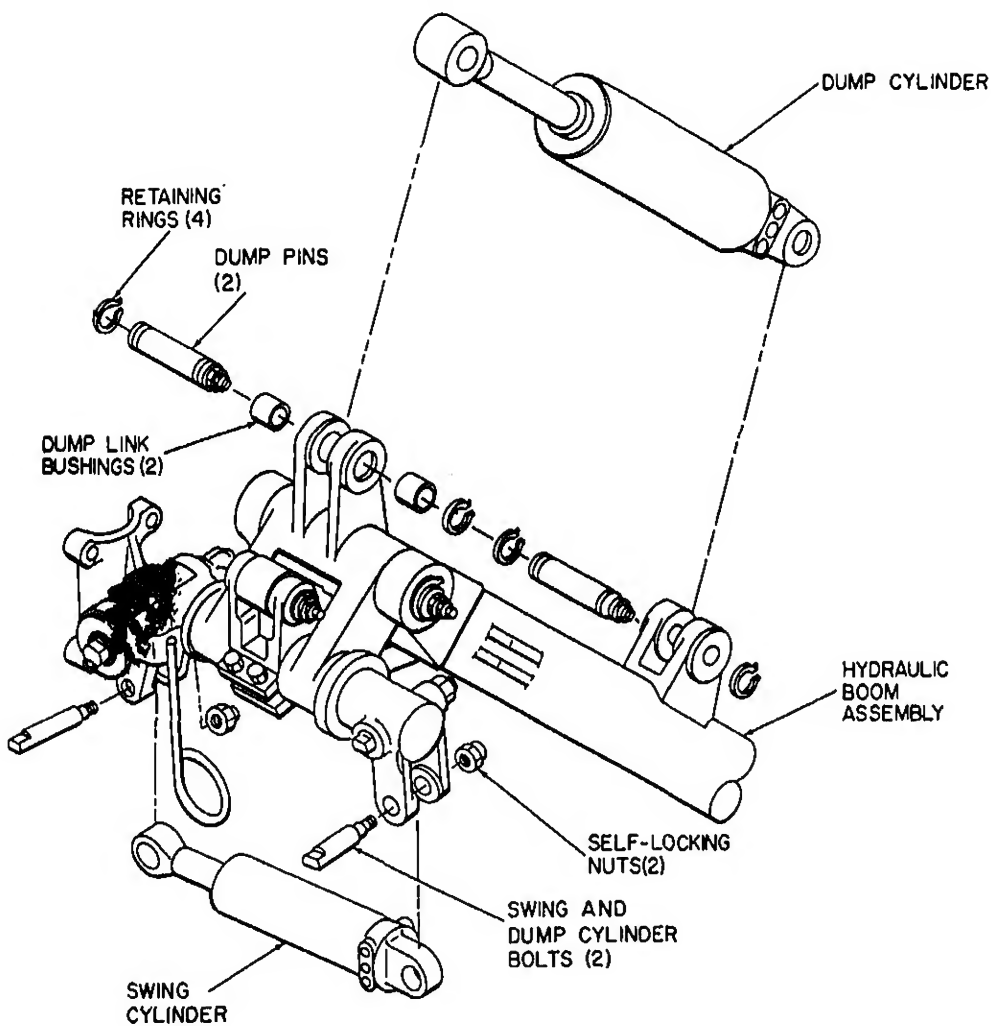
*d. Drill Guide Extension Cylinder.* See figure 3-19 and remove the drill guide extension cylinder.

## **3-47. Installation**

*a.* See figures 3-17 through 3-19 and install the hydraulic cylinders.

*b.* See figure 1-5 and connect the hoses and fittings.





MEC 3820-239-15/3-18

*Figure 3-18. Removal of power dump and swing cylinders.*

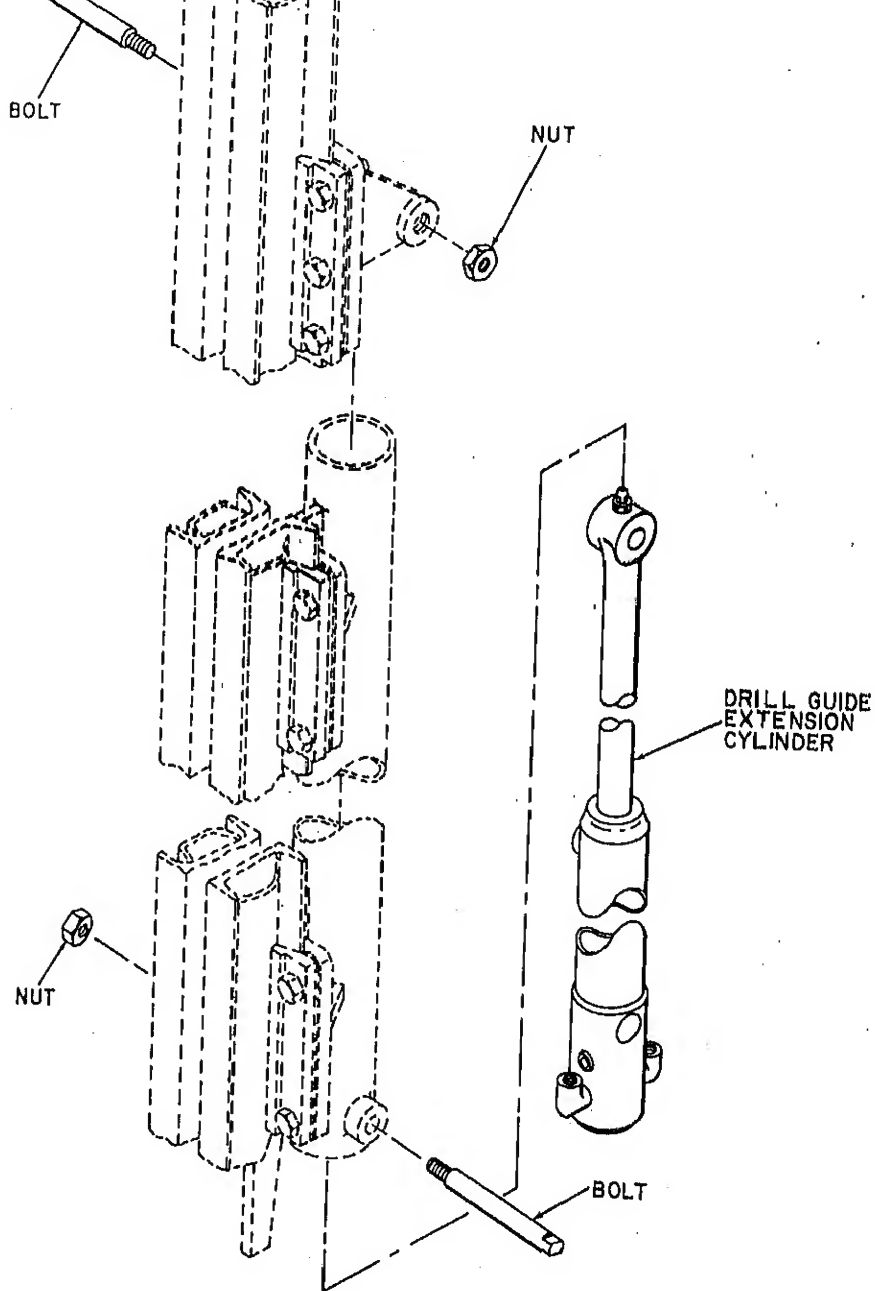


Figure 3-19. Removal of drill guide extension cylinder.

MEC 3820-239-15/3-19

tering valve on the lubricator.

#### **49. Removal**

a. See figure 1-3 and disconnect all hoses and fittings.

#### **3-50. Installation**

a. See figure 3-20 and install the main valve and the manifold lubricator.

b. See figure 1-3 and connect all hoses and fittings.

### **Section XVI. AIR FEED MOTOR**

#### **51. General**

The air feed motor (fig. 1-1) provides the power to feed the drill and move it up and down the drill guide.

#### **52. Removal**

a. See figure 1-4 and disconnect the hoses and fittings.

b. Refer to paragraph 3-26 and remove the feed chain.

*Note.* The feed chain must be removed before the air feed motor can be removed.

c. See figure 3-21 and remove the air motor.

#### **3-53. Installation**

a. See figure 3-21 and install the air motor.

b. Refer to paragraph 3-28 and install the feed chain.

c. See figure 1-4 and connect the hoses and fittings.

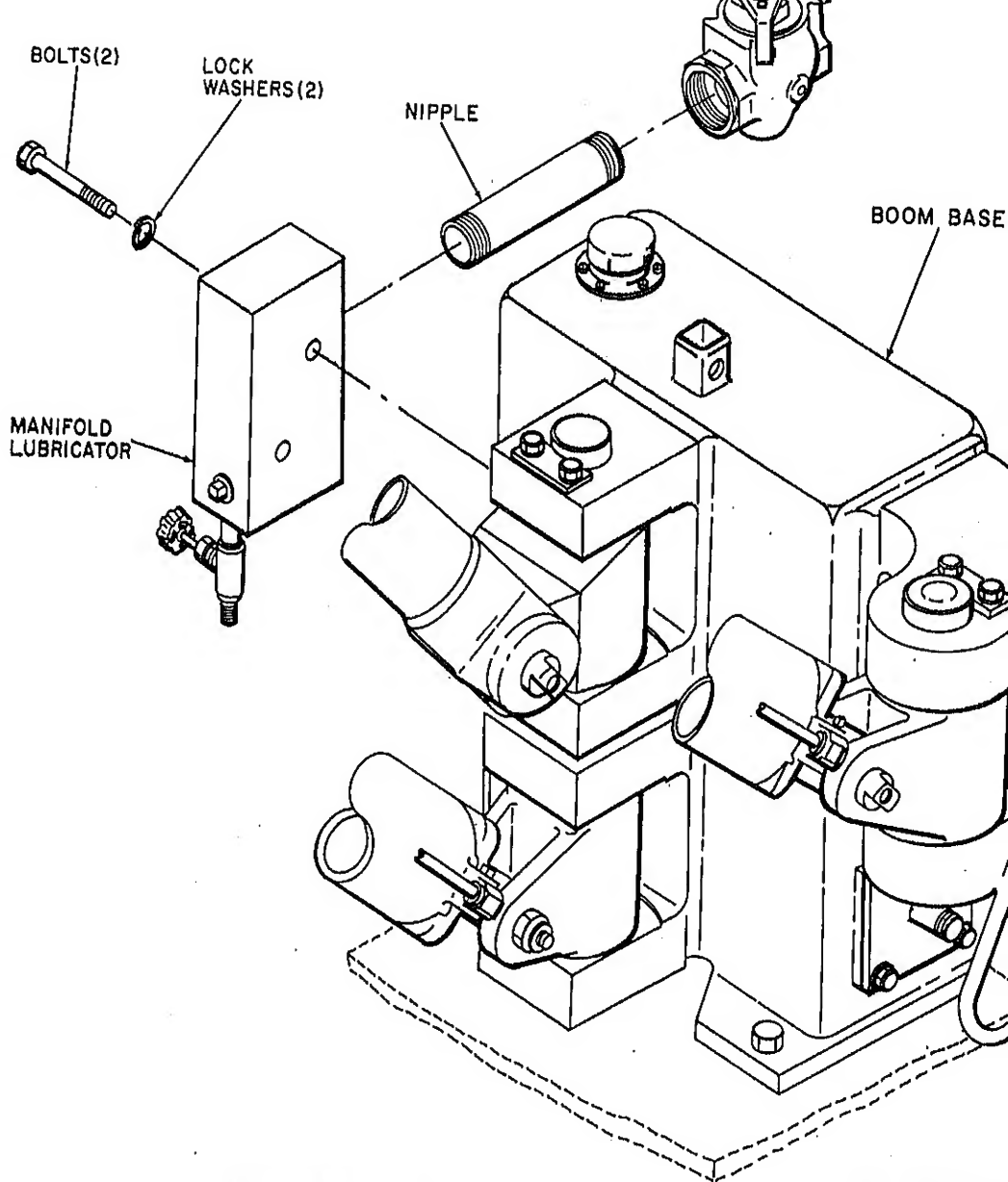


Figure 3-20. Removal of main air valve and manifold lubricator.

MEC 3820-2

## Section XVII. REMOTE CONTROL MANIFOLD

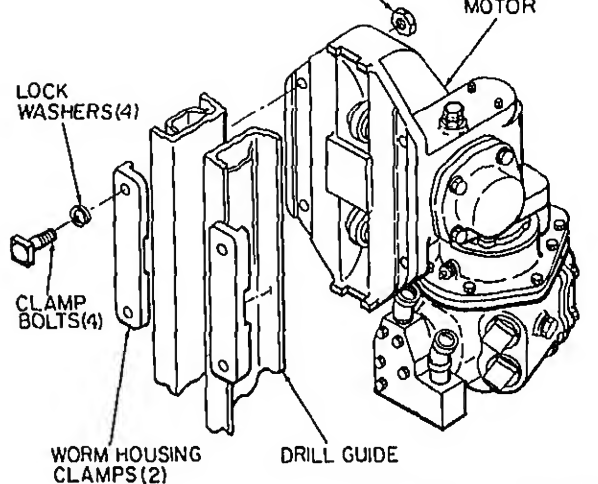
figure 1-4 and disconnect hoses and

figure 3-22 and remove the remote manifold.

### Installation

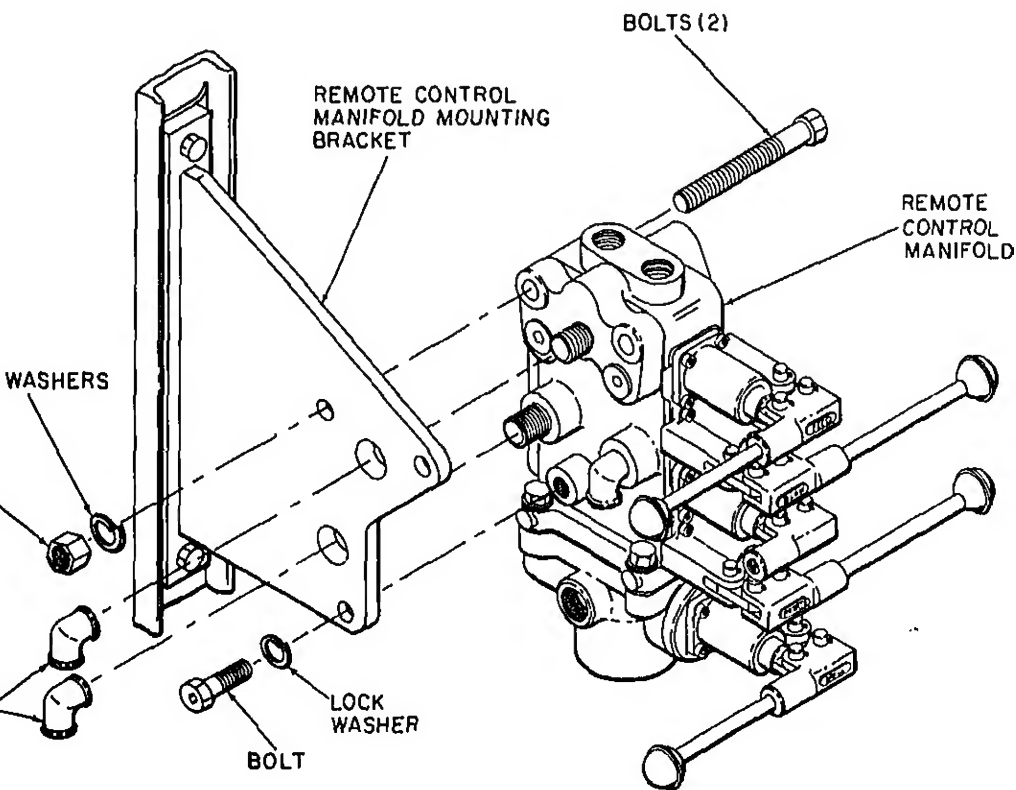
figure 3-22 and install the remote manifold.

figure 1-4 and connect the hoses and



MEC 3820-239-15/3-21

*Figure 3-21. Removal of air feed motor.*





consists of five valves which control hydraulic oil flow to each of the five hydraulic cylinders. Twelve lines are connected to the unit; inlet and return lines for each cylinder, plus a main inlet from the hydraulic pump and a return line to the hydraulic reservoir (fig. 1-5).

### 3-58. Removal

a. See figure 1-5 and disconnect all hoses and fittings.

*Note.* Label each line to facilitate proper installation.

b. See figure 3-23 and remove the hydraulic valve assembly from the mounting bracket.

### 3-59. Installation

a. See figure 3-23 and install the hydraulic valve assembly.

b. See figure 1-5 and connect hoses and fittings.

**Caution:** Be sure hoses are properly connected.

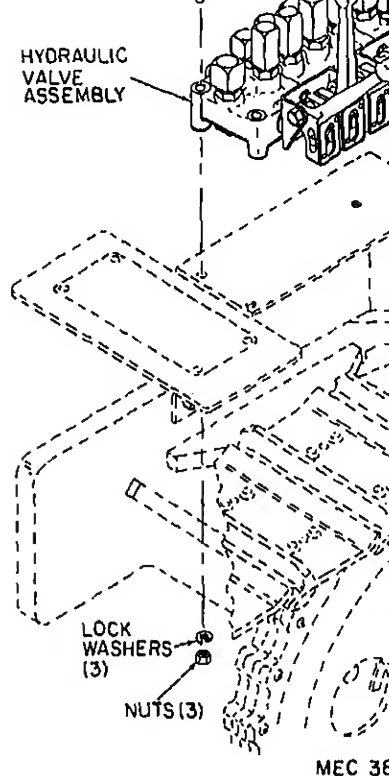
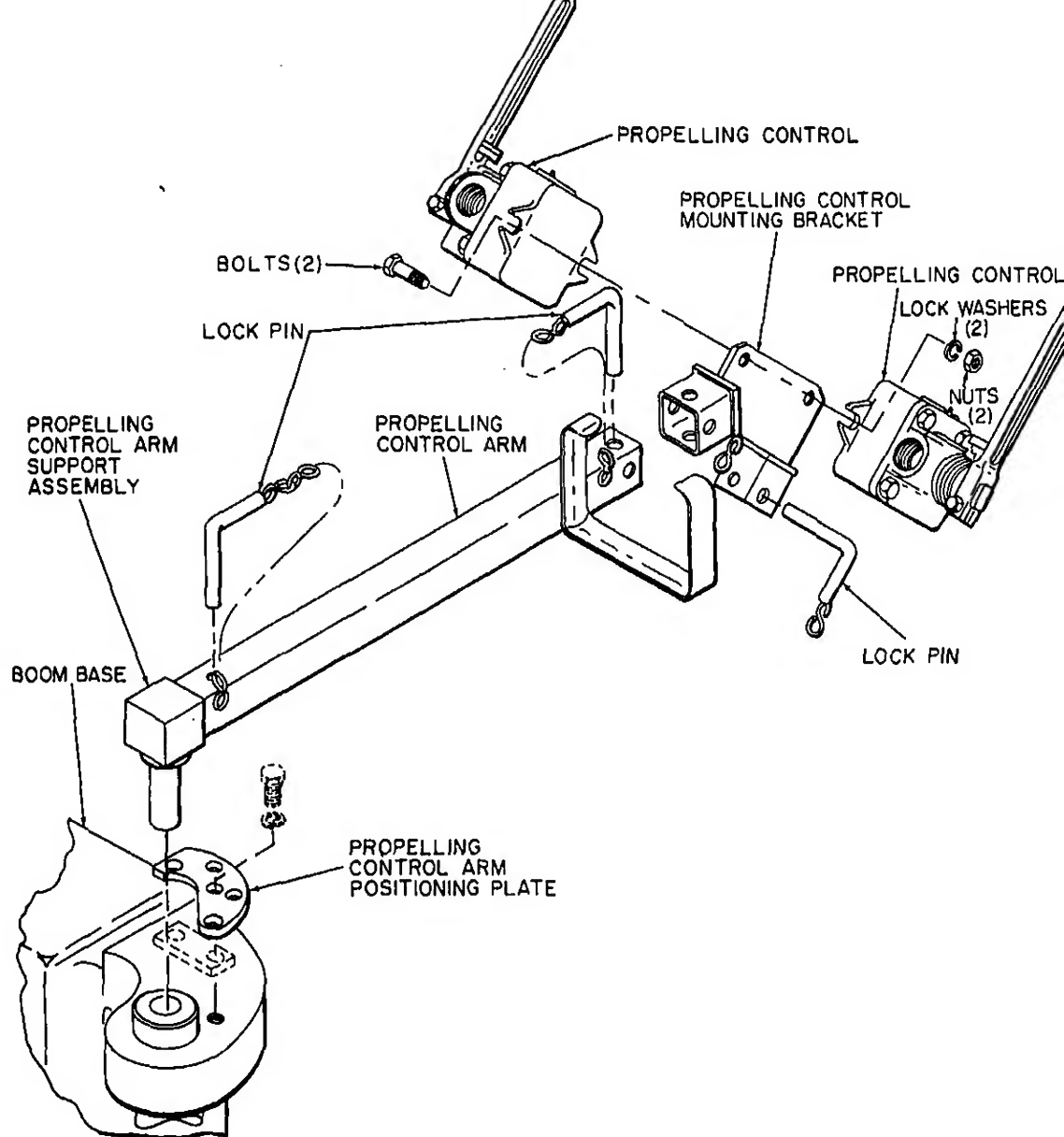


Figure 3-23. Removal of hydraulic



The propelling controls (fig. 1-2) control the flow of air to the propelling air motors for each track. Each control consists of a three-position valve, which can be moved either forward or back, to direct the flow of air one way or the other, causing the propelling air motor to move the track forward or reverse (fig. 1-3). The control is spring-loaded to the center (off) position, and each valve can be operated independently of the other.

a. See figure 1-3 and fittings.

b. See figure 3-24 and lining controls.

### **3-62. Installation**

a. See figure 3-24 and controls.

b. See figure 1-3 and fittings.

## CHAPTER 4

# DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

### Section I. GENERAL

#### 1. Scope

These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the Ingersoll-Rand model CM150A/D475A pneumatic drill. They provide information on the maintenance of the equipment, which is beyond the scope of tools, equipment, personnel, or supplies normally available to using organizations.

#### 4-2. Record and Report Forms

For the record and report forms applicable to direct and general support and depot maintenance, refer to TM 38-750.

*Note.* Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicle Operator's Identification Card) which is carried by operator, shall be kept in a canvas bag mounted on equipment.

### Section II. DESCRIPTION AND TABULATED DATA

#### 3. Description

For a complete description of the pneumatic drill see paragraph 1-8.

#### 4. Tabulated Data

*a. General.* This paragraph contains the overhaul data pertinent to direct and general support and depot maintenance personnel.

##### *b. Traction Units.*

Manufacturer ..... Oliver Corp  
Model ..... OT-176770-AS  
Number of rollers ..... 5  
Width of grousers ..... 10 in.

##### *c. Hydraulic Pump.*

Flow rating ..... 1.5 gpm (gallons per minute)  
Output pressure ..... 2000 psi  
Torque of cover screws ..... 22 to 28 ft-lb

Torque of bolt ..... 12 to 15 ft-lb

##### *e. Propelling Air Motors.*

Power rating ..... 11.4 hp (horse power)  
Number of cylinders ..... 5

##### *f. Hydraulic Valve.*

Manufacturer ..... Alco  
Model ..... 1042CM150  
Pressure setting ..... 2000 psi (pounds per square inch)

*g. Torque Data.* Refer to paragraph 1-20 for a complete list of all hardware used and the corresponding torque values.

*h. Air Piping Diagram.* For propelling air piping diagram see figure 1-3. For drill control piping diagram see figure 1-4.

*i. Hydraulic Piping Diagram.* For hydraulic piping diagram see figure 1-5.

Chuck nut flutes	--	--	--	--
Piston to cylinder clearance	--	--	0.000	0.009
Piston to piston stem bearing clearance	--	--	0.000	0.009
Rifle bar flutes	--	--	--	--
Rifle nut flutes	--	--	--	--
Shank to shank aliner clearance	--	--	--	--
Valve to valve chest clearance	--	--	0.000	0.008

#### TRACTION DRIVES:

Drive shaft OD	2.163	2.165	0.0002T	0.0024L
Drive shaft, stub OD	1.1803	1.1808	0.0001T	0.0008L
Drive shaft, pinion bore OD	2.0462	2.0472	0.0010T	0.0005L
Drive shaft ball bearing ID	2.1648	2.1654	0.0002T	0.0024L
Drive shaft ball bearing OD	3.9364	3.9370	0.0010T	0.0016L
Gear housing, bore OD	3.986	3.988	0.0010T	0.0016L
Motor pinion ball bearing ID	0.9889	0.9848	0.0010T	0.0001T
Motor pinion ball bearing OD	2.0467	2.0472	0.0010T	0.0006L
Motor pinion gear OD	0.9844	0.9840	0.0010T	0.0001T
Planet gear ID	2.8322	2.8334	0.0024T	0.0007T
Planet gear ball bearing ID	1.1807	1.1811	0.0001T	0.0008L
Planet gear ball bearing OD	2.8341	2.8346	0.0024T	0.0007T

#### AIR FEED MOTOR:

Bearing stud OD	0.9835	0.9840	0.0001L	0.008L
Connecting rod bushing wall thickness	0.053	0.107	--	--
Crank pinion bearing ID	0.5906	0.5909	0.0003L	0.0009L
Crank pinion bearing OD	1.6535	1.6540	0.0002T	0.0013L
Crank pinion, small OD	0.5900	0.5903	0.0003L	0.0009L
Crank pinion, large OD	0.6270	0.6275	0.0026T	0.0015T
Cylinder case, lower crank bearing bore ID	2.0475	2.0485	0.0002L	0.0014L
Cylinder case, upper crank bearing bore ID	1.8508	1.8518	0.0001T	0.0014L
Cylinder liner ID	1.7505	1.7530	--	--
Drive gear, bearing bore ID	2.0475	2.0485	0.0002L	0.0014L
Gear case, crank bearing bore ID	1.6538	1.6548	0.0002T	0.0018L
Gear case, inner worm bearing bore ID	2.4405	2.4413	0.0015T	0.0007L
Idler wheel bushing ID	1.0030	1.0040	0.0030L	0.0045L
Idler wheel shaft OD	0.9995	1.0000	0.0030L	0.0045L
Inner worm bearing ID	1.1805	1.1810	0.0015T	0.0005T
Inner worm bearing OD	2.4410	2.4420	0.0015T	0.0007L
Inner worm wheel bearing ID	1.2600	1.2605	0.0015T	0.0005T
Inner worm wheel bearing OD	2.8345	2.8355	0.0007T	0.0016L
Lower crank bearing ID	0.9841	0.9843	0.0004T	0.0003L
Lower crank bearing OD	2.0471	2.0473	0.0002L	0.0014L
Lower throw crank, bearing OD	0.9840	0.9845	0.0004T	0.0003L
Lower throw crank, pinion ID	0.6250	0.6255	0.0025T	0.0015T
Outer worm bearing ID	0.9835	0.9840	0.0015T	0.0005T
Outer worm bearing OD	2.4410	2.4420	0.0015T	0.0003L
Outer worm wheel bearing ID	1.1805	1.1810	0.0015T	0.0005T
Outer worm wheel bearing OD	2.4410	2.4420	0.0007T	0.0015L
Piston wrist pin OD	0.3762	0.3765	0.0003L	0.0013L
Piston wrist pin bore ID	0.3755	0.3755	--	--

Component	Minimum	Maximum	Minimum	Maximum	
Rotary valve, shaft OD	1.1210	1.1240	--	--	0.0000
Sprocket, shaft bore ID	1.2500	1.2505	0.0015T	0.0005T	0.0000
Sprocket shaft, gear surfaces OD	1.2510	1.2515	0.0015T	0.0005T	0.0000
Sprocket shaft, inner bearing OD	1.2610	1.2615	0.0015T	0.0005T	0.0000
Sprocket shaft, outer bearing OD	1.1815	1.1820	0.0015T	0.0005T	0.0000
Thrust bearing ID	0.9841	0.9843	0.0011L	0.0008L	0.0000
Thrust bearing OD	2.0471	2.0473	0.0002L	0.0014L	0.0000
Upper crank bearing ID	0.7874	0.7878	0.0006T	0.0003L	0.0000
Upper crank bearing OD	1.8504	1.8509	0.0001T	0.0014L	0.0000
Upper throw crank, bearing OD	0.7875	0.7880	0.0006T	0.0003L	0.0000
Worm, shaft bore ID	1.0000	1.0005	0.0005T	0.0005L	0.0000
Worm housing, inner worm wheel bearing bore ID	2.8348	2.8360	0.0007T	0.0015L	0.0000
Worm housing, outer worm bearing bore ID	2.4405	2.4413	0.0015T	0.0003L	0.0000
Worm housing cap, bearing bore ID	2.4413	2.4425	0.0007T	0.0015L	0.0000
Worm shaft, inner bearing OD	1.1815	1.1820	0.0015T	0.0005T	0.0000
Worm shaft, outer bearing OD	0.9845	0.9850	0.0015T	0.0005T	0.0000
Worm shaft, worm surface OD	1.0003	1.0008	0.0005T	0.0005L	0.0000
Worm wheel, bore ID	1.2495	1.2505	0.0020T	0.0005T	0.0000
HYDRAULIC PUMP AIR MOTOR:					
Front ball bearing ID	0.9843	0.9847	0.0002T	0.0005T	0.0000
Front ball bearing OD	2.4409	2.4414	0.0010T	0.0001L	0.0000
Front end plate, bore ID	2.4404	2.4410	0.0010T	0.0001L	0.0000
Rear ball bearing ID	0.7874	0.7878	0.0002T	0.0005L	0.0000
Rear ball bearing OD	2.0472	2.0477	0.0012T	0.0002T	0.0000
Rear end plate, bore ID	2.0465	2.0470	0.0012T	0.0002T	0.0000
Rotor, small shaft OD	0.7873	0.7876	0.0002T	0.0005L	0.0000
Rotor, large shaft OD	0.9842	0.9845	0.0002T	0.0005L	0.0000
PELLETTING AIR MOTORS:					
Motor case, bearing bore ID	3.1497	3.1507	0.0004T	0.0011L	0.0000
Pin end crank, bearing OD	1.5750	1.5755	0.0007T	0.0003L	0.0000
Pin end crank ball bearing ID	1.5748	1.5753	0.0007T	0.0003L	0.0000
Valve end crank, bearing OD	1.5750	1.5755	0.0007T	0.0003L	0.0000
Valve end crank ball bearing ID	1.5748	1.5753	0.0007T	0.0003L	0.0000
Valve end crank ball bearing OD	3.1496	3.1501	0.0004T	0.0011L	0.0000
ACTION UNITS:					
Bearing retainer bore ID	2.4395	2.4405	0.0025T	0.0005T	0.0000
Complete inner bearing ID	1.3750	1.3755	0.0015T	0.0005T	0.0000
Complete inner bearing OD	2.7170	2.7180	0.0025T	0.0005T	0.0000
Complete inner ring gear bearing ID	2.0000	2.0005	0.0001T	0.0009L	0.0000
Complete inner ring gear bearing OD	3.5000	3.5010	0.003T	0.001T	0.0000
Complete outer bearing ID	1.1250	1.1255	0.0020T	0.0010T	0.0000
Complete outer bearing OD	2.4410	2.4420	0.0025T	0.0005T	0.0000
Complete outer ring gear bearing ID	1.6250	1.6255	0.0000T	0.0010L	0.0000
Complete outer ring gear bearing OD	3.1250	3.1260	0.003T	0.001T	0.0000

Component	Minimum	Maximum	Minimum	Maximum
Ring gear and hub assembly, inner bearing ID	3.498	3.499	0.003T	0.001T
Ring gear and hub assembly, outer bearing OD	3.123	3.124	0.003T	0.001T
Shaft and spacer housing, inner bearing bore ID	2.7155	2.7165	0.0025T	0.0005T
Shaft and spacer housing, inner ring gear bearing OD	1.9996	2.0001	0.0001T	0.0009L
Shaft and spacer housing, outer ring gear bearing OD	1.6245	1.6250	0.0000T	0.0010L
Track idler bushing retainer ID	1.496	1.499	0.004L	0.008L
Track idler bushing retainer OD	2.376	2.378	0.005T	0.001T
Track idler hub ID	2.373	2.375	0.005T	0.001T
Track idler shaft, bushing OD	1.491	1.492	0.004L	0.008L
Track idler shaft, support OD	1.1250	1.1255	0.0005L	0.0030L
Track idler support, shaft ID	1.126	1.128	0.0005L	0.0030L
Track roller bushing ID	1.4940	1.4975	0.0270L	0.0405L
Track roller bushing retainer OD	2.376	2.379	0.006T	0.001T
Track roller shaft OD	1.457	1.467	0.0270L	0.0405L

T denotes tight (interference) fit.

L denotes loose (clearance) fit.

## CHAPTER 5

# GENERAL MAINTENANCE INSTRUCTIONS

### Section I. SPECIAL TOOLS AND EQUIPMENT

#### Special Tools and Equipment

When special tools or equipment is required for maintenance on the pneumatic

#### 5-2. Specially Designed Tools and Equipment

No specially designed tools or equipment is required for performing maintenance on the pneumatic drill.

### Section II. TROUBLESHOOTING

#### Troubleshooting

This section provides information useful in diagnosing and correcting unsatisfactory operation of the pneumatic drill or any components. Each trouble symptom is followed by a list of probable causes. The probable remedy recommended is described opposite the probable cause.

#### Pneumatic Drill Inoperative

##### Symptom

##### Possible remedy

Drill will not start ----- Inspect hoses, fittings, remote control manifold and air feed motor (fig. 1-4).

Drill is clogged ----- Disassemble and clean drill parts in approved solvent. Blow scale and dirt from lines before connecting (para 6-3).

Drill has poor lubrication ----- Adjust manifold lubricator. Check that oil vapor is observed in exhaust.

Drill has worn parts ----- Disassemble and inspect drill for damaged parts. Clean and lubricate

#### 5-5. Drifter Drill Operates Sluggishly or Erratically

##### Probable cause

##### Possible remedy

Dirt or foreign material clogging hoses.

Check hoses and fittings for damage and restrictions. Clean and replace as necessary.

Dirt clogging drill ----- Disassemble and inspect drill parts. Clean and lubricate (para 6-3).

Dieseling (ignition of air and oil in cylinder) which causes scoring and damage to parts.

Check for possible over-lubrication or running air cushion. Reset manifold lubricator metering valve. Keep drill feed proper and avoid running drill into and out of hole at full throttle.

Compressor supplying insufficient air.

Check compressor and main air line. Make sure main air valve is fully open.

Improper lubrication ----- Readjust manifold lubricator if required. Check oil level in lubricating oil reservoir. Check piston and cylinder for heat checks. Replace



Improper lubrication ----- parts before assembling (para 6-8).  
Readjust manifold lubricator if required. Check oil level in lubricating oil reservoir.

### 5-7. Air Feed Motor Operates with Low Power

Probable cause	Possible remedy
Worn bearings -----	Disassemble and inspect all bearings (para 6-10c). Replace if required.
Pistons and cylinder liners worn or scored.	Disassemble and inspect for worn and scored parts (para 6-10c). Replace if required.
Rotary valve loose in rotary valve bushing.	Inspect and replace rotary valve if required.

### 5-8. Hydraulic Pump Operating Improperly

Probable cause	Possible remedy
Air supply insufficient -----	Check hoses and fittings for leakage.
Hydraulic oil flow restricted.	Check suction oil filter, return line oil filter and reservoir for dirt and clogging (fig. 1-5).
Flexible coupling loose -----	Disassemble and inspect for loose or damaged parts (para 6-17).
Improper lubrication -----	Check oil level in lubricating oil reservoir or adjust metering valve if required.

direction. position of 6-17).

### 5-9. Hydraulic Valve Operating Improperly

Probable cause	Possible
Excessive leakage -----	Check hoses. Check control O-rings.
Control level linkage parts damaged.	Disassemble and inspect parts for damage (6-24).
Relief valve clogged causing erratic pressure.	Disassemble and inspect relief valve (6-24). Check thickness of shim (2000 psi) for relief.
Hydraulic oil flow restricted.	Check suction and return lines and all fittings for restriction (fig. 1-5).

### 5-10. Hydraulic Cylinders Operating Improperly

Probable cause	Possible
Excessive oil leakage at gland nut.	Disassemble and inspect cylinder and packing. Replace if required (6-59, and 6-60).
Oil leakage at check valves at cylinders.	Disassemble and inspect for damage. Replace if required (paras. 6-61, 6-62, and 6-66).

## Section III. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND AUXILIARY ITEMS

### 5-11. General

a. Removal of major components not covered in this section are provided in Chapter 3. The remainder of the assemblies are covered in Chapter 6.

b. See figures 1-3 through 1-5 for piping

### 5-12. Complete Drill Mounting

#### a. Removal.

- (1) Disconnect the manifold air line connection to the drill mounting (fig. 1-1).
- (2) Remove the 14 bolts

tive clamps to facilitate installation.

#### *Installation.*

- (1) See figure 5-1 and install the complete drill mounting (7). Make sure that the clamp shims (6) are installed in the same manner as removed.
- (2) Connect the air piping from the manifold lubricator.

### **3. Power Guide Extension Mounting**

#### *Removal.*

- (1) Disconnect the hydraulic lines from the drill guide extension cylinder (fig. 1-5).
- (2) Remove the four swivel cap bolts (1, fig. 5-2), nuts (2), and lock washers (3), and separate the two guide mounting swivel caps (4) from the guide mounting swivel of the power dump and swing assembly (6), freeing the power guide extension mounting (5).

#### *Installation.*

- (1) See figure 5-2 and install the power guide extension mounting on the power dump and swing assembly.
- (2) Connect the hydraulic lines to the drill guide extension cylinder (see fig. 1-5).

### **4. Power Dump and Swing Assembly**

#### *Removal.*

- (1) Disconnect the hydraulic lines from the dump and swing cylinders (fig. 1-5).
- (2) Remove the two retaining rings (1, fig. 5-3) and dump pin (2) securing the dump cylinder of power dump and swing assembly (5) to hydraulic boom assembly (6).
- (3) Remove the two retaining rings (1) and dump pin (2) securing the dump

assembly (6).

- (5) Remove the complete power dump and swing assembly (5).

#### *b. Installation.*

- (1) See figure 5-3 and install the power dump and swing assembly to the hydraulic boom assembly.
- (2) Connect the hydraulic lines to the dump and swing cylinders (fig. 1-5).

### **5-15. Hydraulic Boom Assembly**

#### *a. Removal.*

- (1) Disconnect the hydraulic lines from the boom swing and boom lift cylinders (fig. 1-5).
- (2) Remove the screws (1 and 2, fig. 5-4) and lock washers (3) securing king pin locking plates (4) to boom base assembly (6).
- (3) Using a suitable hoist to support the weight of hydraulic boom assembly (5), remove the cylinder pedestal king pins of the hydraulic boom assembly from the mounting brackets of the boom base assembly.

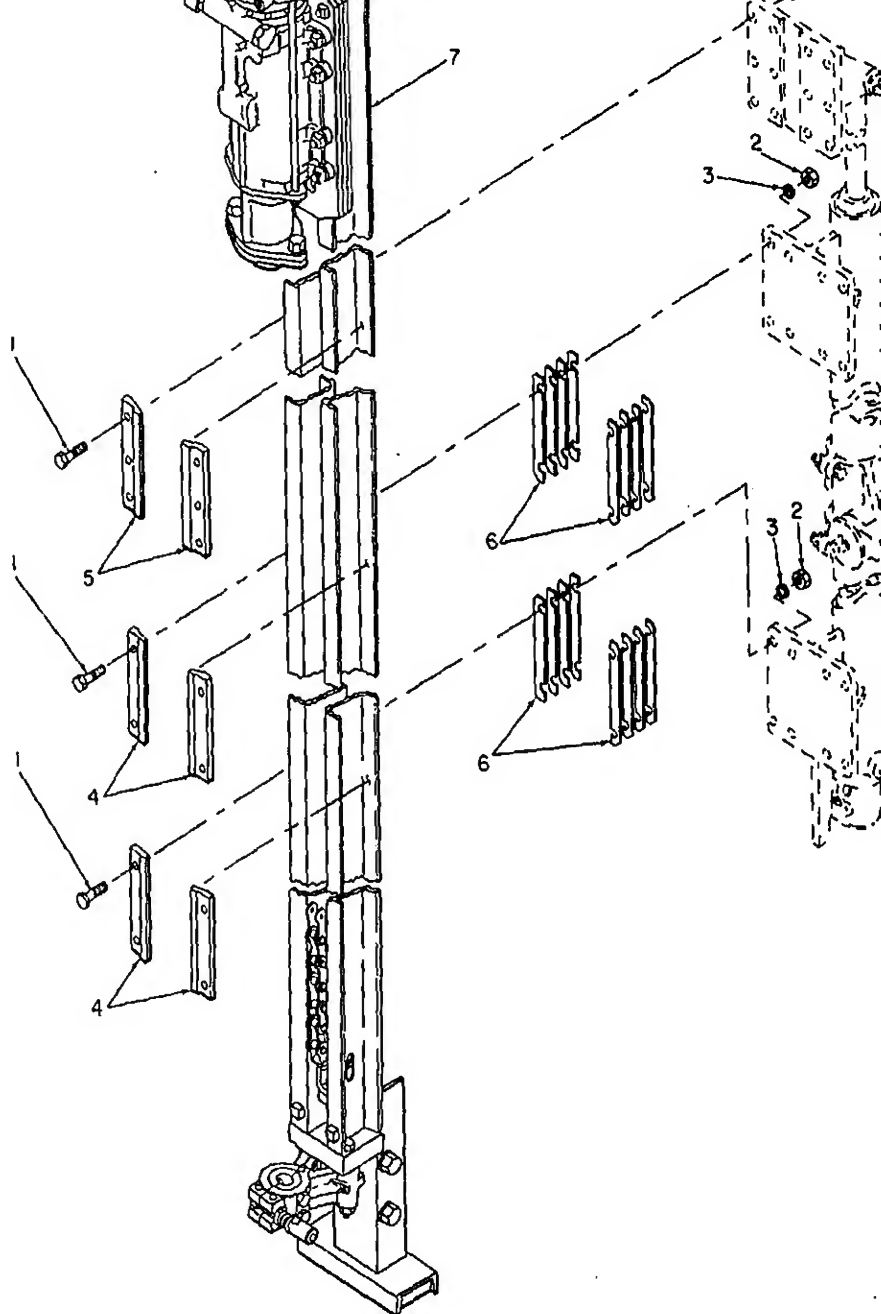
#### *b. Installation.*

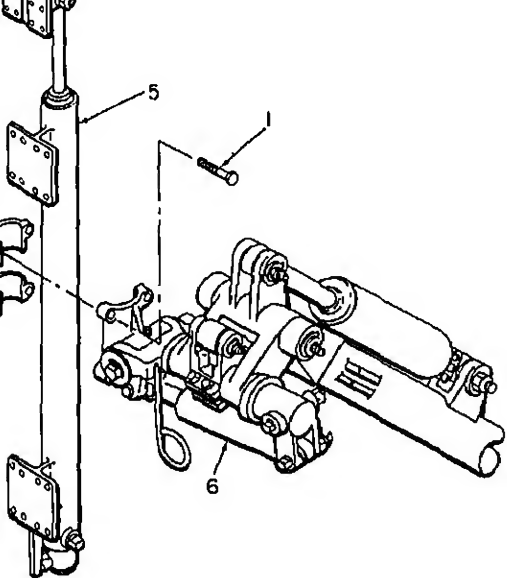
- (1) See figure 5-4 and install the hydraulic boom assembly.
- (2) Connect the hydraulic lines to the boom swing and boom lift cylinders (fig. 1-5).

### **5-16. Boom Base Assembly**

#### *a. Removal.*

*Note.* Although the boom base assembly is secured to the frame only by five sets of hardware, removal is very time consuming because of the fact that both the hydraulic pump assembly and the manifold lubricator assembly are mounted to this base. This paragraph is written under the assumption that both of these assemblies have already been removed as described in Chapter 8.





MEC 3820-239-15/5-2

Side mounting swivel cap bolt, 7/8-9 x 5 in.

(4)

Lock washer, hex, 7/8-9 (4)

Lock washer, lock, 7/8 in. (4)

Side mounting swivel cap (2)

Power guide extension mounting

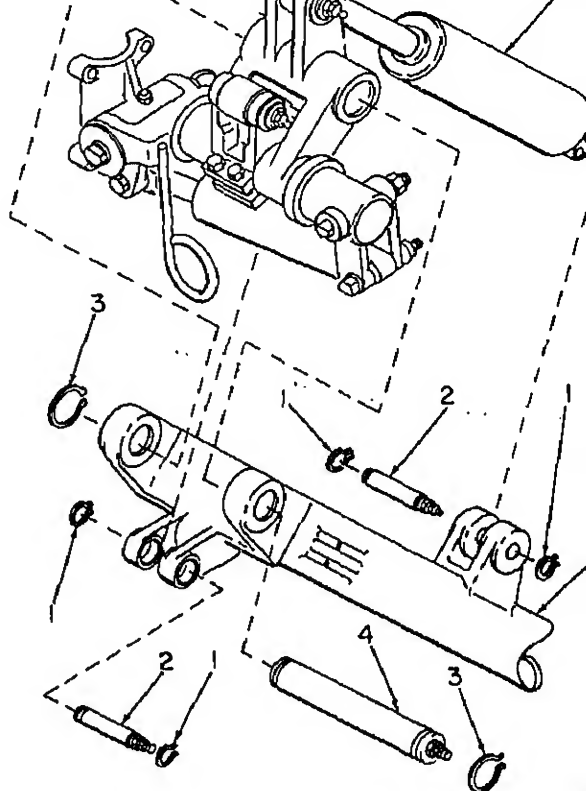
Power dump and swing assembly

Figure 5-2. Removal and installation of power guide extension mounting.

drain adapter under the main frame, and remove magnetic plug (2) and gasket (3), allowing the hydraulic reservoir to empty.

2) Disconnect the hydraulic fittings at the suction oil filter and the return line oil filter (fig. 1-5).

3) Remove the two screws (4, fig. 5-5) and lock washers (7) from the tapped holes in the main frame (9), and remove the three screws (5), nuts (6), and lock washers (7) from the remaining three holes in the boom base assembly (8) and main frame



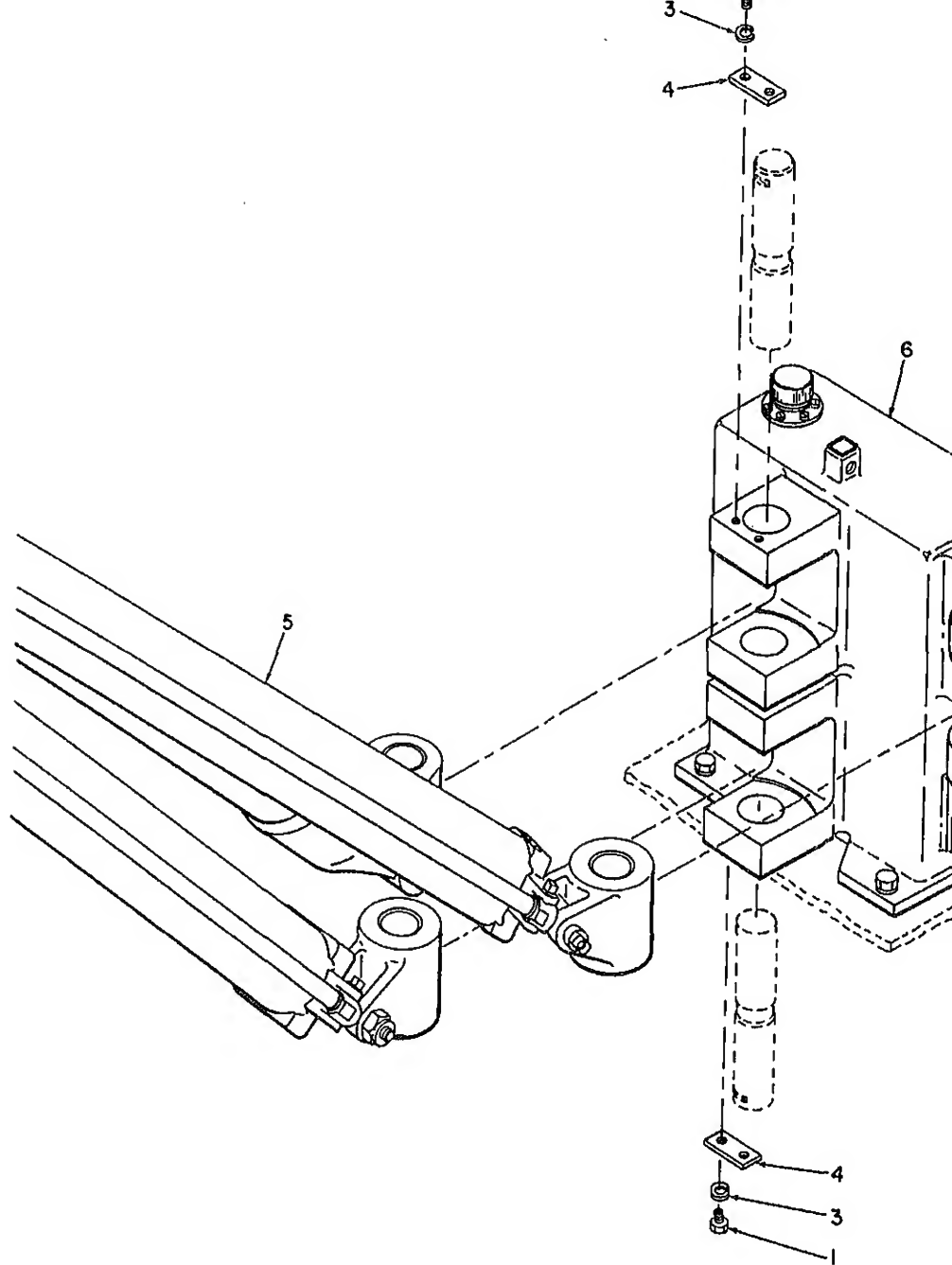
MEC 3820-239-15

- 1 Retaining ring (4)
- 2 Dump pin (2)
- 3 Retaining ring (2)
- 4 Dump pivot pin
- 5 Power dump and swing assembly
- 6 Hydraulic boom assembly

Figure 5-3. Removal and installation of power dump and swing assembly.

(4) Using a suitable hoist, carefully lift the boom base assembly (8) from the main frame (9), being careful not to damage the protruding hydraulic drain adapter.

Note. It may be desirable to remove the hydraulic drain adapter, nipple, and elbow from the bottom of the boom base assembly before attempting to lift the boom assembly.



### b. Installation.

**Note.** Before installing the boom base assembly, clean and flush the hydraulic reservoir, clean the suction oil filter and magnetic plug, and replace the return line oil filter as described in Chapter 3, Section V.

- (1) See figure 5-5 and install the boom base assembly.
- (2) See figure 1-5 and make all hydraulic connections required.

## 5-17. Complete Traction Drive

### a. Removal.

**Note.** The procedure for both complete traction drives is identical. Only the orientation is different. The following procedure and illustrations cover only the left (roadside) traction drive.

- (1) Disconnect the air piping fittings at the traction drive, propelling air motor, and brake (fig. 1-3).
- (2) Remove the six nuts (1, fig. 5-6), and lock washers (2) from the housing flange of traction unit (6).
- (3) Slide complete traction drive (4), with studs (3) attached, out of the traction unit housing and the mounting holes in the main frame.

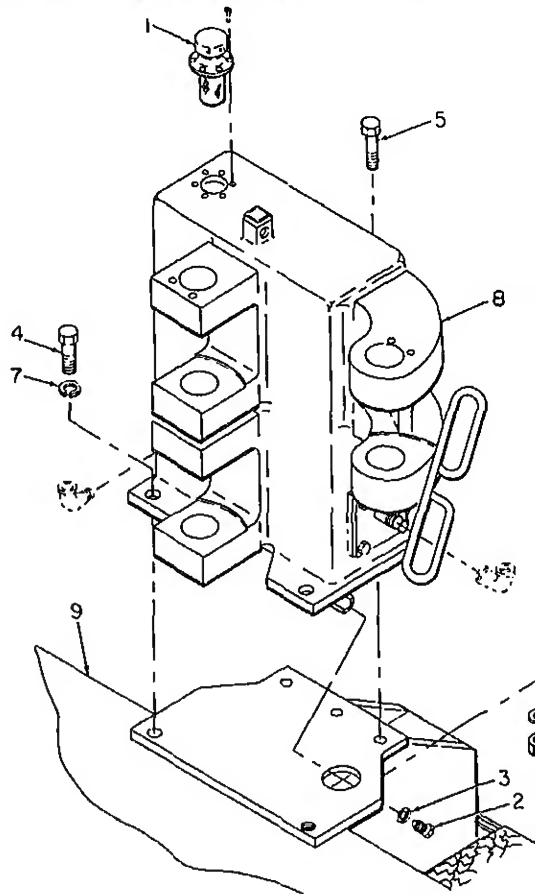
### b. Installation.

- (1) See figure 5-6 and install the complete traction drive.
- (2) See figure 1-3 and make all air piping connections required.

## 5-18. Auxiliary Items

**a. General.** The auxiliary items for the pneumatic drill consist of the tool box, the tools provided in the box, drill shank pieces, and instruction and identification plates.

**b. Removal.** Normally removal is required only if parts are damaged. The only items requiring removal are the tool box and instruction and identification plates.

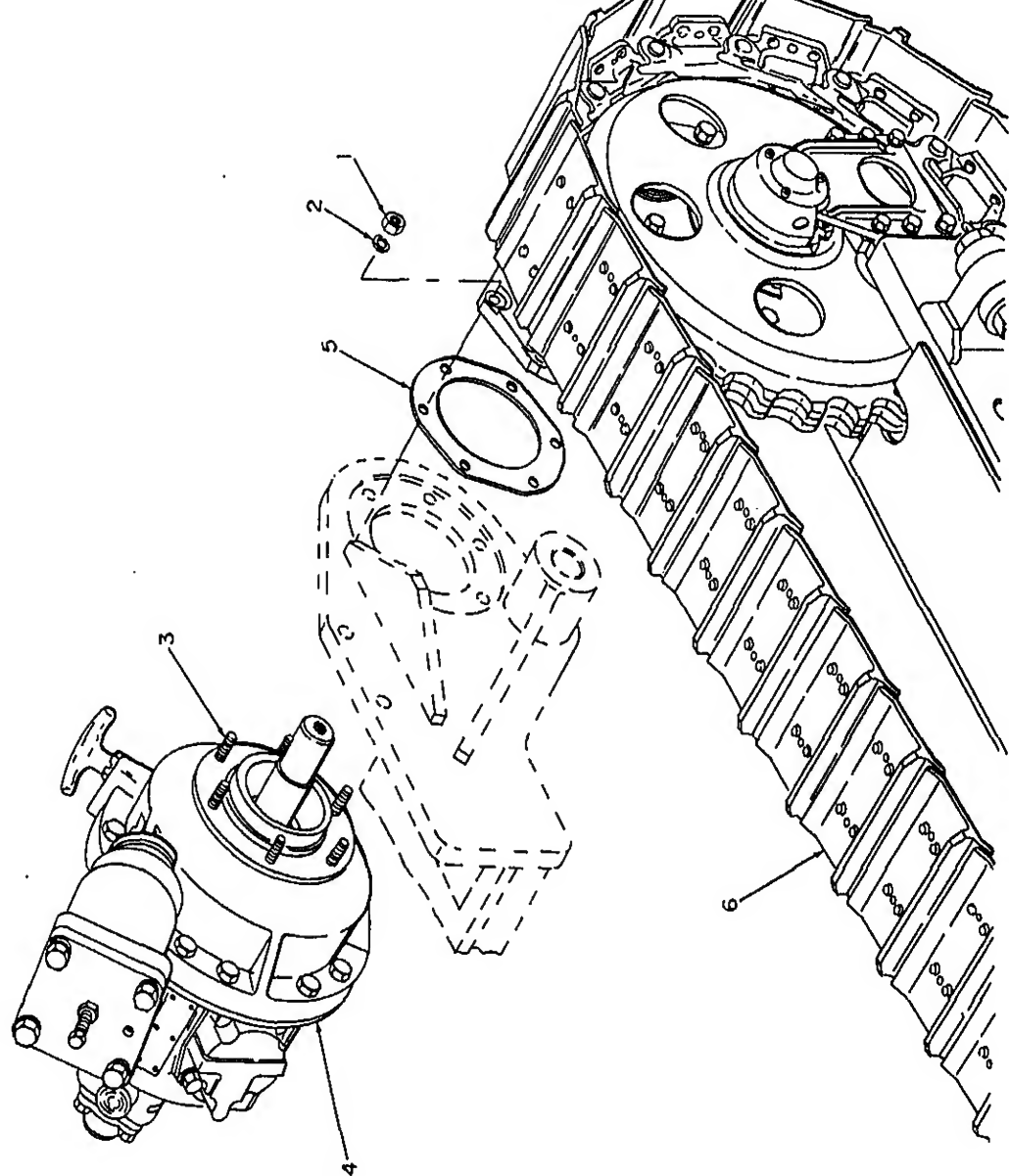


MEC 3820-239-15.

- 1 Vent cap
- 2 Magnetic drain plug, 3/4-16
- 3 Gasket
- 4 Screw, cap, hex-hd, 1-8 x 2 1/4 in. (2)
- 5 Screw, cap, hex-hd, 1-8 x 3 1/4 in. (3)
- 6 Nut, hex, 1-8 (3)
- 7 Washer, lock, 1 in. (5)
- 8 Boom base assembly
- 9 Main frame

**Figure 5-5. Removal and installation of boom assembly.**

- (11), and lock washers (12), and move the tool box from the frame.
- (2) To remove damaged plates, remove the four drive screws (1) holding

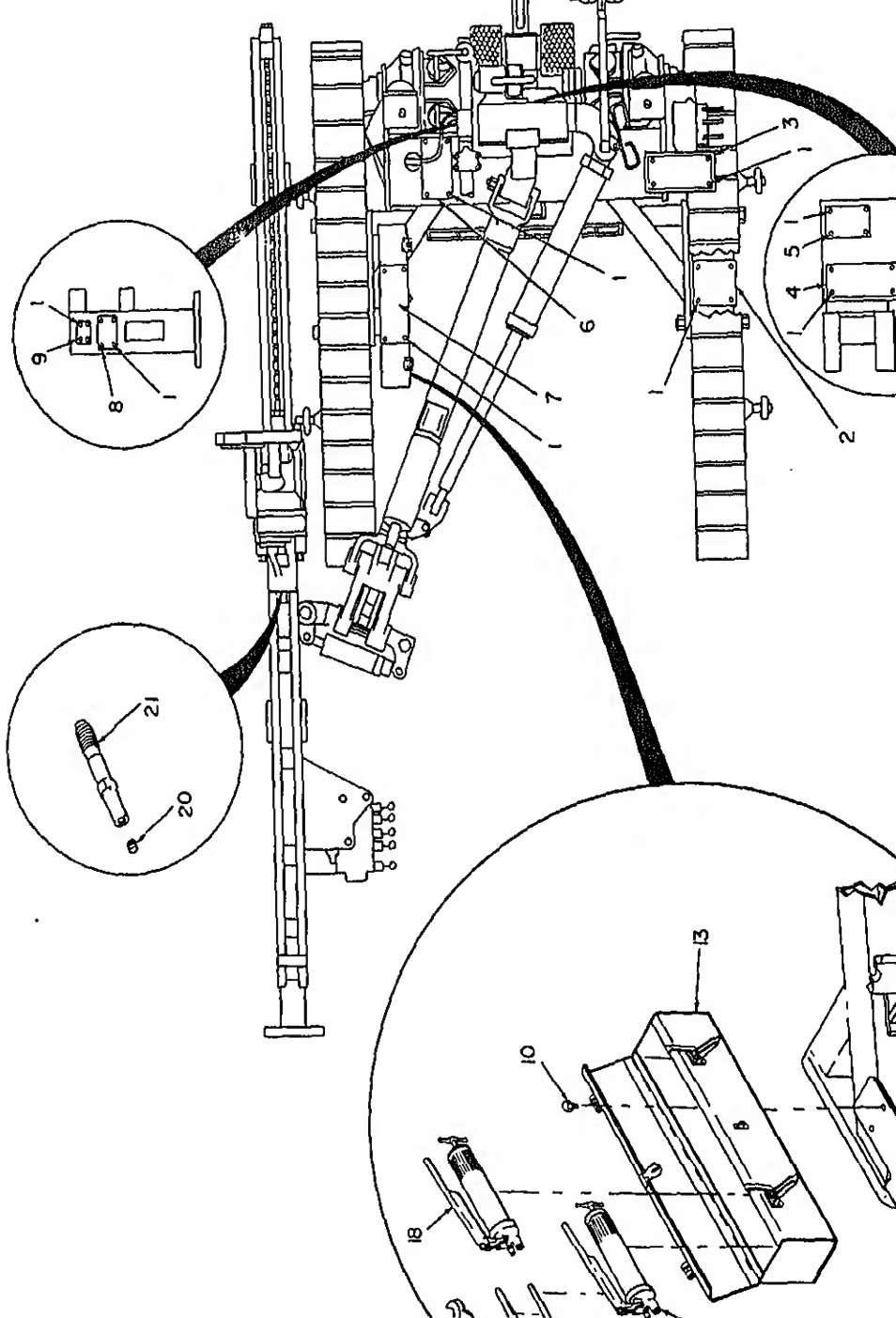


rt, hex, 5/8-11 (6)  
asher lock, 5/8 in. (6)  
nd, 5/8-11 x 3 in. (6)

- 4 Complete traction drive (in shown, rn opposite)
- 5 Spacer plate gasket
- 6 Traction unit (lh shown, rh opposite)

*Figure 5-6—Continued.*





screw, binding-hd, 3/8 in. long (32)  
 portation data instruction plate  
 ublic valve operation instruction plate  
 illing operation instruction plate  
 ation instruction plate  
 ator operation instruction plate  
 peration instruction plate  
 ry identification plate  
 ercial nameplate  
 , cap, hex-hd, 1/2-13 x 1 in. (4)  
 hex, 1/2-13 (3)

12 Washer, lock, 1/2 in. (4)  
 13 Tool box  
 14 Open end wrench, 1 in.  
 15 Open end wrench, 1 5/16 in.  
 16 Track adjusting wrench  
 17 Grease gun hose assembly with coupler, 12 in.  
 18 Grease gun  
 19 Grease gun  
 20 Shank piece seal (1 rqr plus 11 spares supplied)  
 21 Shank piece (1 rqr plus 11 spares supplied)

Figure 5-7—Continued.



## CHAPTER 6

### REPAIR INSTRUCTIONS

#### Section I. DRIFTER DRILL

##### 1. General

This section contains repair instructions for the drifter drill.

##### 2. Removal

Remove the drifter drill as described in paragraph 3-33.

##### 3. Disassembly

Disassemble drifter drill in the numerical sequence as illustrated on figure 6-1. Follow the procedures specified below:

a. If the shank piece is attached to the drift-drill, remove chuck jaw retainer bolts (1, fig. 1) and nuts (2), and separate chuck jaw retainer (3) with the shank piece.

b. Remove hose stem (4) with related parts (5 through 9), air connection plug (10), and lower hose connection (12) with related parts (13 and 14).

c. Remove tube retainer (15) and O ring (16). Remove blower tube (19) with blower tube washer (17) and blower tube rubber (18) attached.

d. Remove nuts (21) and assembly rods (20), and pull air inlet housing (42) and backhead (36), with assembled parts intact, from cylinder (54).

*Note.* The air inlet housing and backhead are removed together to avoid the possibility of the rotation pawls (41) falling out.

e. Separate air inlet housing (42) from backhead (36), and remove rifle bar (37)

cam pinion handle (25) from the top of the backhead, and slide rotation selector cam pinion (26) out from the bottom of the backhead.

g. Remove backhead cap (27), and all piston parts (29 through 35) from backhead (36).

*Note.* If the parts do not come out easily, insert a screwdriver into the cam pinion hole of the backhead, and force out the piston.

h. Force rotation pawl housing (38) out of the air inlet housing (42), and remove rotation pawl housing key (39), rotation pawl plug (40), and rotation pawls (41).

i. Remove the assembled valve chest parts from cylinder (54) by inserting a 3/4-inch diameter bolt (approximately 10 inches long) into the cylinder with the head down. Engage the bottom of valve chest cover (49) with the bolt, and pull the parts out of the cylinder.

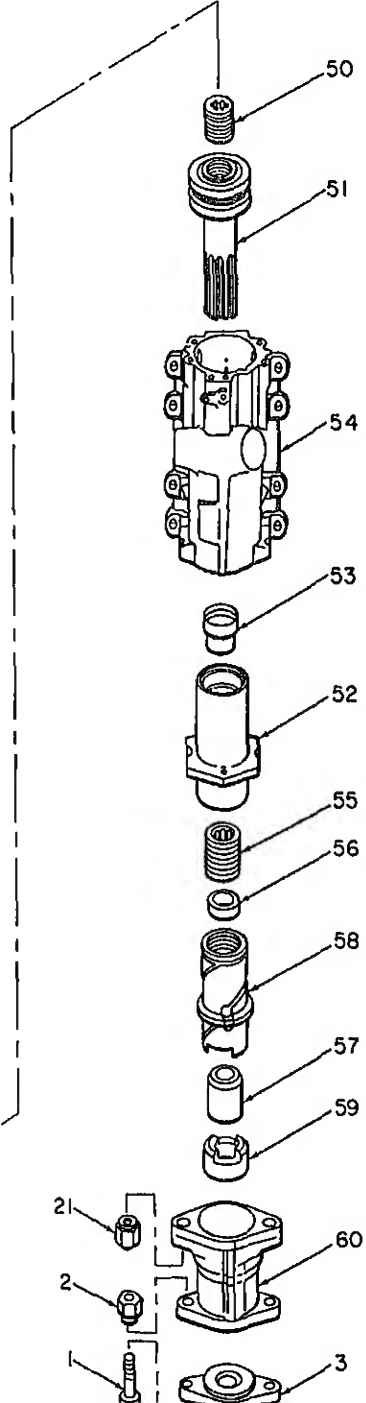
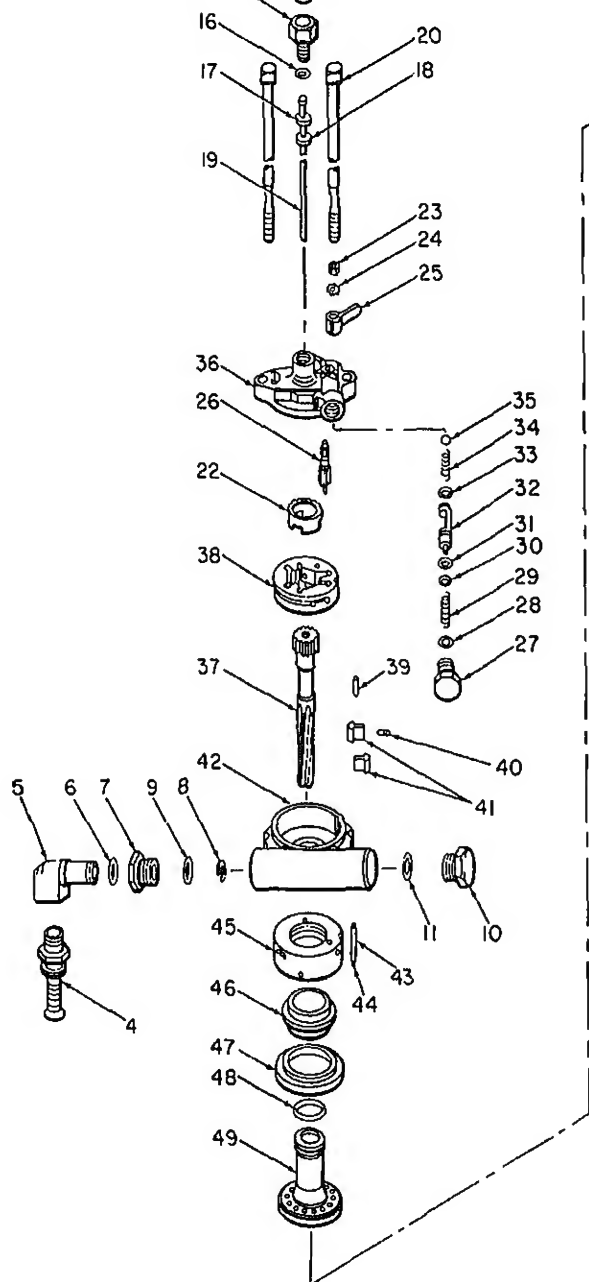
*Caution:* When the valve chest parts are removed, be careful not to lose valve chest key (43).

j. Slide out valve chest cover (49). Remove valve (46). Separate front valve chest (47) from the valve chest cover by inserting a screwdriver through the ports in the cover and tapping evenly with a mallet.

*Caution:* Tap the front valve chest evenly to avoid cocking the part in the cover.

k. Insert rifle bar (37) through the cylinder (54) and wedge it into piston (51). Pull the piston out of the cylinder.

l. Separate the cylinder (54) with assembled



Air connection	35	Cam piston spring seat
O-ring	36	Backhead
Air connection cap	37	Rifle bar
Retaining ring	38	Rotation pawl housing
O-ring	39	Rotation pawl housing key
Air connection plug	40	Rotation pawl plunger (6)
O-ring	41	Rotation pawl (6)
Blower hose connection	42	Air inlet housing
O-ring	43	Valve chest key
Blower hose connection cap	44	O-ring (2)
Tube retainer	45	Back valve chest
O-ring	46	Valve
Blower tube washer	47	Front valve chest
Blower tube rubber	48	O-ring
Blower tube	49	Valve chest cover
Assembly rod (2)	50	Rifle nut
Nut, hex, 7/8-14 (2)	51	Piston
Rotation selector cam	52	Piston stem bearing
Nut, hex, 1/2-20	53	Piston stem bearing sleeve
Washer, lock, external tooth 1/2 in.	54	Cylinder
Rotation selector cam pinion handle	55	Chuck nut
Rotation selector cam pinion	56	Chuck nut spacer
Backhead cap	57	Shank aligner
O-ring	58	Chuck
Right-hand cam piston spring	59	Chuck jaw
Wear washer	60	Fronthead

Figure 6-1—Continued.

n. Separate remaining parts as necessary.

#### 4. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

#### 5. Inspection and Repair

a. *General.* Inspect all parts for wear and flat checks. Inspect for wear as per table 4-1.

b. *Piston and Cylinder.* If clearance between piston (51) and cylinder (54) is excessive, determine which part is worn by inserting a new piston in the cylinder and rechecking clearance. If clearance is then satisfactory, the piston was worn.

c. *Rifle Bar.* Inspect rifle bar (37) for wear on ratchet teeth. If the teeth are rounded to a 1/16-inch radius, replace the rifle bar.

to a 1/16-inch radius on one edge. If the parts are worn on both edges, they must be replaced.

#### 6-6. Reassembly

Reassemble drifter drill in reverse of the numerical sequence as illustrated on figure 6-1. Note the following special procedures.

a. When assembling rotation pawls (41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60), insert them into the rotation pawl housing (38), and then press the pawl housing into the air inlet housing (42).

**Caution:** Use extreme care to keep the keyway of rotation pawl housing (38) aligned with the keyway of air inlet housing (42). Make sure that the cutout section of the rotation pawl housing is exposed.

b. Apply a dab of grease on each rotation

ion (26) in backhead (36), make sure that the alignment marks (punch dots) on the pinion are aligned with the marks on rotation selector cam (22).

d. When installing rotation selector cam piston (32) into backhead (36), make sure that the groove in the piston is aligned with the pinion. If the alignment marks are not visible, proceed as follows:

- (1) Install rotation selector cam piston (32) with related parts in backhead (36).
- (2) Install rotation selector cam pinion (26) in backhead (36) and mesh with

handle (25) is attached to the piston. When the piston is in the neutral position (4 o'clock position), the center of the piston will be meshed with the teeth of the pinion.

- (3) Mark the alignment marks on the meshing teeth of both the pinion and the piston, to facilitate repair.

## 6-7. Installation

See figure 8-12 and install the mounting plate on the drill mounting plate.

# Section II. COMPLETE DRILL MOUNTING

## 6-8. General

This section contains repair instructions for the complete drill mounting. The complete drill mounting consists of the remote control manifold, air feed motor, centralizer, drill mounting plate, and complete drill guide.

## 6-9. Removal

Remove the complete drill mounting as described in paragraph 5-12a.

## 6-10. Disassembly

a. *Complete Drill Mounting.* Disassemble complete drill mounting in the numerical sequence as illustrated on figure 6-2.

*Note.* Air hoses and hose fittings are not shown on figure 6-2 in order to avoid confusion. See figure 1-4 for complete piping diagram.

b. *Remote Control Manifold.* Disassemble remote control manifold in the numerical sequence as illustrated on figure 6-3.

*Note.* The manifold is made with five valves, four of which are used. The quantities specified in the legend for figure 6-3 reflect the actual parts installed.

c. *Air Feed Motor.* Disassemble air feed motor in the numerical sequence as illustrated on figure 6-4 (Sheets 1 through 4) and the procedures specified below:

- (1) Remove magnetic plug (44) and pipe plugs (45), and remove them from the worm housing.
- (2) Remove manifold bolts (7) and washers (8) and separate manifold (9) from cylinder. Remove seal rings (10) from manifold.
- (3) Remove live air stud (11) and lock washer (12), and remove reverse valve hole stud (13) and air stud (15). Do not remove reverse valve (18).
- (4) Remove screws (20) and lift off (21), and lift off (22) and thrust plate (23). Remove upper bearing cap (24) and bearing spring (25).
- (5) Remove screws (27) and lift off (28), and separate (71) and gear case (96) from the order case (96).
- (6) Remove self-locking

- from stud (33). Remove rotary valve (34).
- ) Only if worn or damaged, press rotary valve bushing (36) out of cylinder case (96), through the exhaust cover opening.

*Note.* Cylinder liner key (85) is permanently installed in the cylinder case to locate and align the rotary valve bushing (86). Do not attempt to remove the key.

- ) Remove cylinder liner caps (39) from cylinder case (96).
- ) Remove screws (41), lock washers (42), and housing cap (43) with housing cap shim (44).
- ) Remove worm shaft grease seal (62).
- ) Using a suitable puller, remove the assembled worm shaft (63), with inner and outer worm bearings (64 and 69), long and short worm spacers (65 and 68), worm key (67), and worm (66).

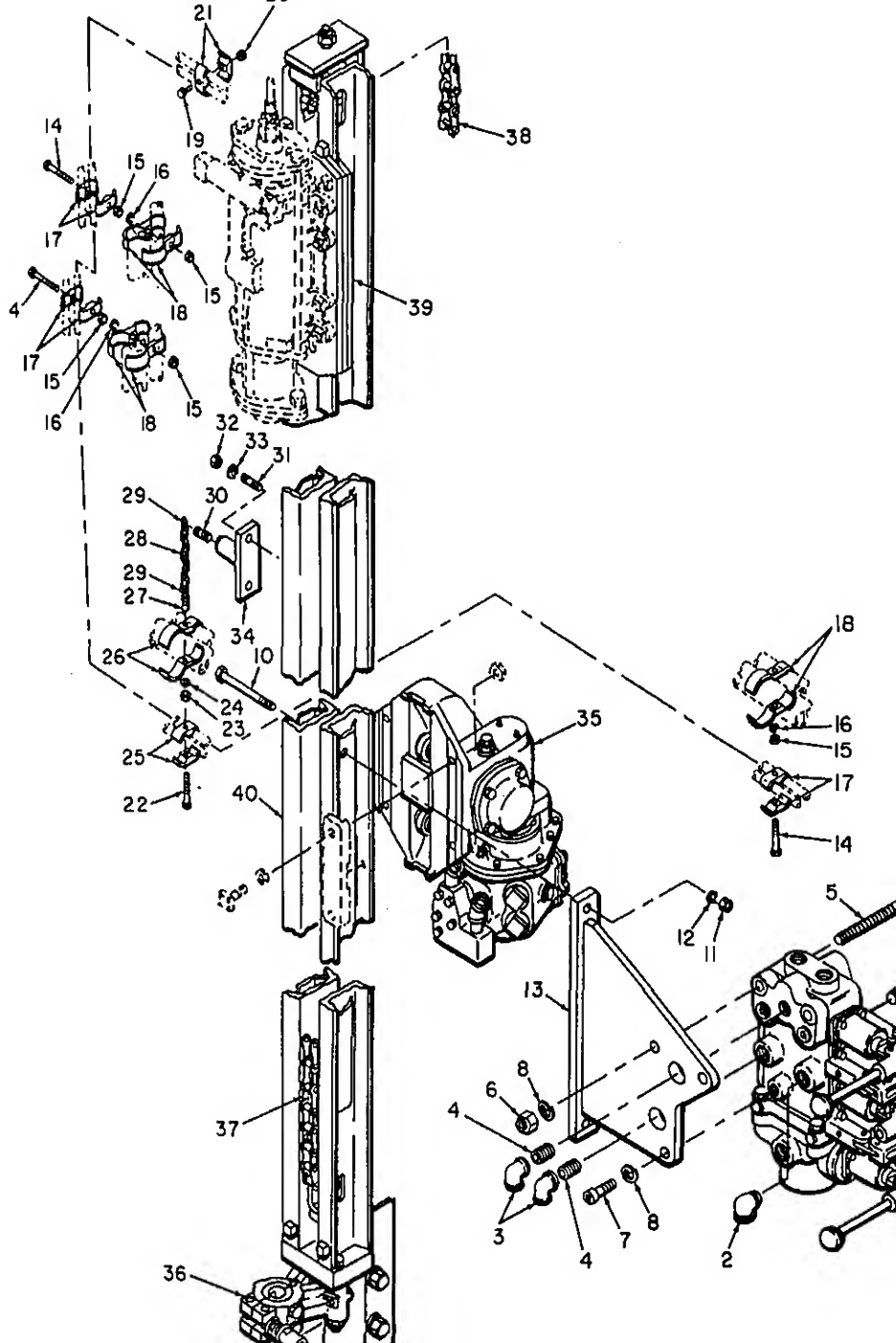
*Note.* Rotate worm shaft (68) to free worm (66) from worm wheel (54).

- ) Using a suitable bearing puller to bear on the inner races, remove inner worm bearing (64) and outer worm bearing (69) from worm shaft (63). Remove other parts from the worm shaft.
- ) Cut or straighten the ends and remove cotter pins (50). Remove sprocket shaft nuts (51) and sprocket shaft washers (52).
- ) Using a suitable press, bear on the sprocket end of sprocket shaft (56), until sprocket (59) and sprocket key (58) are freed and can be removed from the opening in the side of worm housing (71).

worm wheel bearing (57) from sprocket shaft (56).

- (18) Remove worm wheel (54) and worm wheel key (55) from sprocket shaft (56).
- (19) Remove lubrication fittings (46) from idler wheel shafts (47). Press out the idler wheel shafts from idler wheel bushings (49) and worm housing (71). Remove idler wheels (48) and the idler wheel bushings. Press the bushings out of the idler wheels.
- (20) Remove screws (76), lock washers (77), and crank shaft cap (78).
- (21) Using a suitable bearing puller, remove crank pinion parts, consisting of crank pinion (73), lower crank bearing (75), and Woodruff key (74), from lower throw crank (90).
- (22) Rotate the crank assembly until one piston (82) is at the end of its stroke, farthest out of cylinder liner (80).
- (23) Raise the crank assembly to free the piston from the cylinder liner. When the piston is free from the liner, move the crank sideways to free the other piston on the same throw crank (89 or 90) from its cylinder liner (80).
- (24) Free the other two pistons (82) from their cylinder liners (80) in the same manner as in step (23).
- (25) Drive out crank pins (85) from crank center piece (95), and upper and lower throw cranks (89 and 90). Cut or straighten the ends and remove cotter pin (86). Remove castellated nut (87) and pinch bolt (88), securing the halves of crank center piece (95). Insert the pinch bolt from the opposite side to spread crank center piece (95) and pull out upper throw crank (89) and lower throw crank (90).





Nipple, 1 x 1 1/2 in. (2)  
 Screw, cap, hex-hd, 3/4-10 x 6 in. (2)  
 Nut, hex, 3/4-10 (2)  
 Screw, cap, hex-hd, 3/4-10 x 1 1/4 in.  
 Washer, lock, 3/4 in. (3)  
 Remote control manifold  
 Screw, cap, hex-hd, 3/4-10 x 7 1/2 in. (2)  
 Nut, hex, 3/4-10 (2)  
 Washer, lock, 3/4 in. (2)  
 Remote control manifold mounting bracket  
 Bolt, hex-hd, 3/8-16 x 3 1/2 in. (3)  
 Nut, hex, 3/8-16 (6)  
 Washer, lock, 3/8 in. (8)  
 Hose clamp half (6)  
 Hose clamp half (6)  
 Screw, cap, hex-hd, 1/4-20 x 1 1/4 in.  
 Nut, hex, 1/4-20

24 Washer, lock, 3/8 in.  
 25 Hose clamp (2)  
 26 Clamp half (2)  
 27 Eye nut  
 28 Straight link chain  
 29 Cold shut (2)  
 30 Stud  
 31 Stud, 5/8-11 x 2 1/4 in. (2)  
 32 Nut, hex, 5/8-11 (2)  
 33 Washer, lock, 5/8 in. (2)  
 34 Hose hangar block  
 35 Air feed motor assembly  
 36 Centralizer  
 37 Feed chain  
 38 Feed chain coupler link (2)  
 39 Drill mounting plate  
 40 Complete drill guide

Figure 6-2—Continued.

and inside connecting rods (93 and 94).

(27) Remove outside connecting rods (93) and inside connecting rods (94) from the upper and lower throw cranks (89 and 90).

(28) Press out connecting rod bushings (92) from the connecting rods. Pull crank pin sleeves (91) off upper and lower throw cranks (89 and 90).

(29) Remove nut (83). Using a suitable bearing puller to bear on the inner race, pull upper crank bearing (84) off the shaft of upper throw crank (89).

(30) Only if worn or damaged, press cylinder liners (80) out of cylinder case (96), using a wooden block to bear on the liner. Make sure that the block does not interfere with cylinder liner keys (79).

*Note.* Do not remove cylinder liner keys (79), which are for locating and aligning the cylinder liners in cylinder case (96).

*Centralizer.* Disassemble centralizer in numerical sequence as illustrated on figure

*f. Complete Drill Guide.* Disassemble complete drill guide in the numerical sequence illustrated on figure 6-7.

## 6-11. Cleaning

Clean all parts with an approved solvent and blow dry with compressed air.

## 6-12. Inspection and Repair

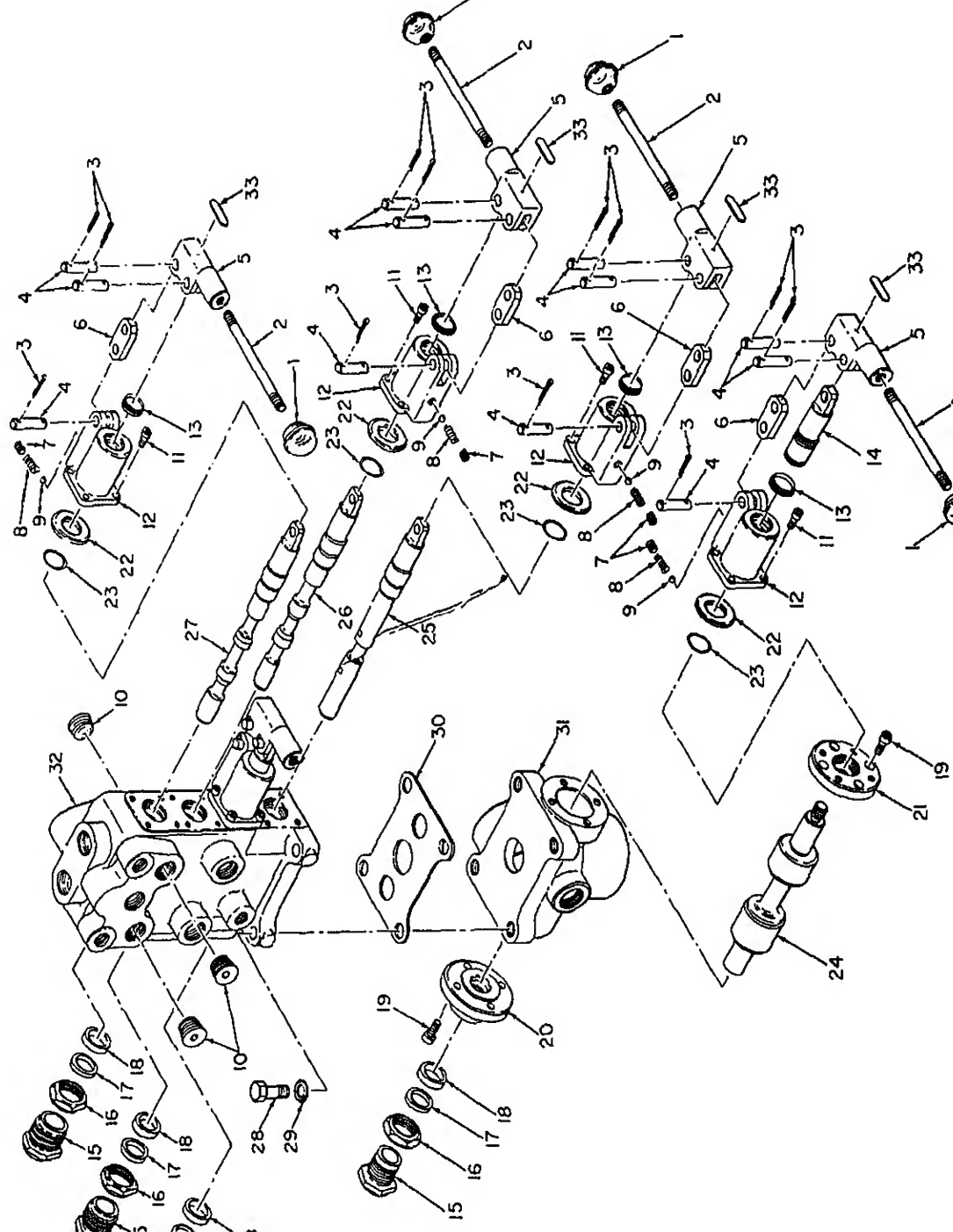
a. Inspect all parts for wear and damage and replace if necessary.

b. Inspect all bearings for cracks, looseness and wear. Replace if unserviceable.

c. Inspect all gears and pinions for cracked, chipped teeth, damaged bores, and excessive wear. Replace if in doubt as to the serviceability of a part.

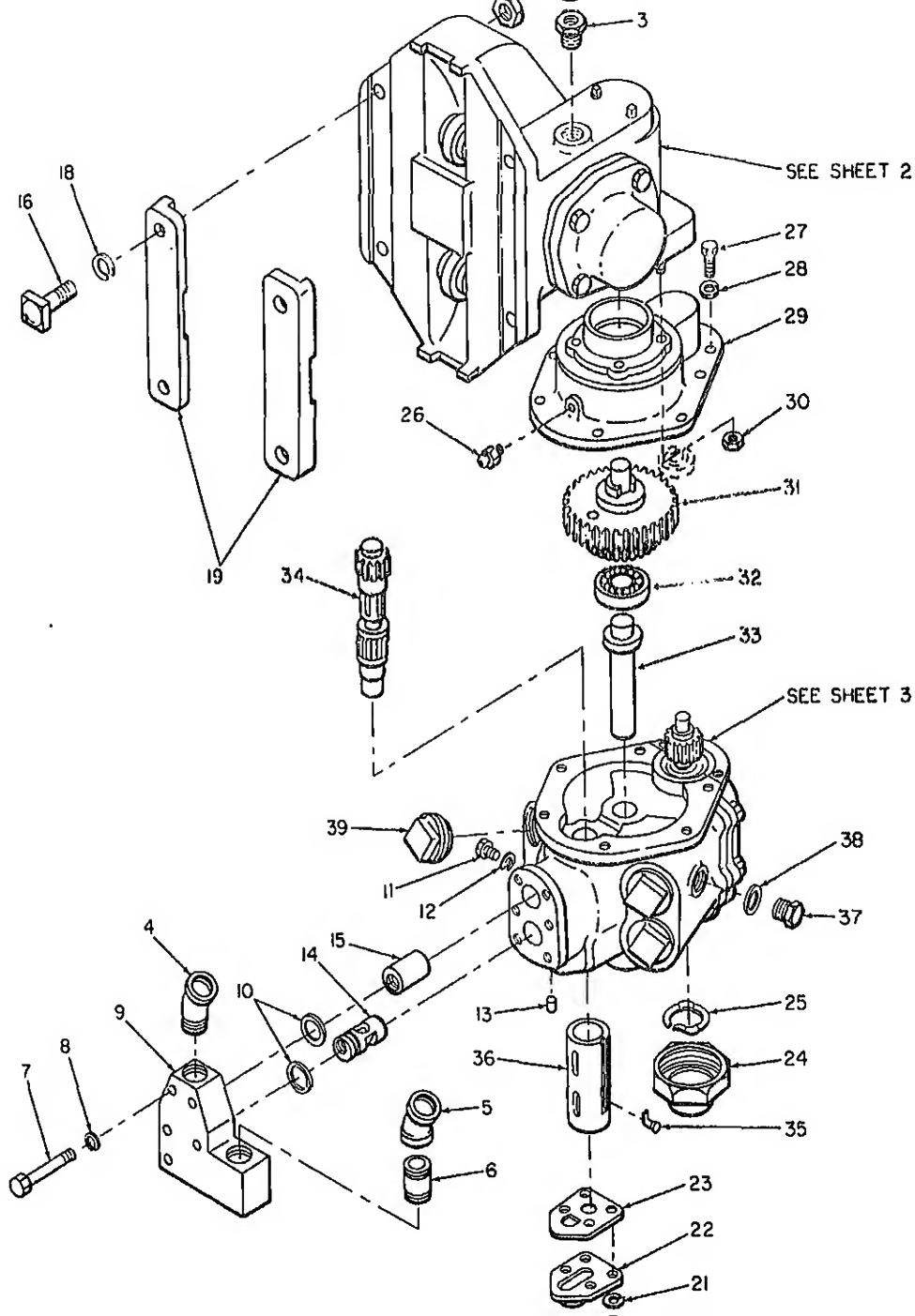
d. Inspect upper and lower throw cranks (89 and 90, fig. 6-4) and crank center pin (95) for scoring marks, cracks, wear, and other damage. If any of the three parts is damaged the entire set must be replaced, since the parts are machined together and comprise a matching set.

e. Inspect connecting rod bushings (92) for wear. Using a micrometer or other suitable



12	Spool end cap (5)	23	O-ring (5)
13	Wiper (5)	24	Drill spool
14	Drill spool detent	25	Intermittent spool
15	Spool friction ring adjusting nut (5)	26	Blow and rotation spool (2)
16	Jam nut, hex, 1 1/2-12 (5)	27	Feed spool
17	Friction washer (5)	28	Screw, cap, hex-hd, 5/8-11 x 1 3/4 in. (4)
18	Friction ring (5)	29	Washer, lock, external tooth, 5/8 in. (4)
19	Screw, cap, hex-hd, 5/16-18 x 3/4 in. (8)	30	Drill spool body gasket
20	Drill spool friction end cap	31	Drill spool body
21	Drill spool end cap plate	32	Manifold body
22	Alignment washer (5)	33	Labels
hd, 1/8 in. (5)			
hd, 1 in. (3)			
16-18 x 3/4 in. (20)			

Figure 6-3—Continued.



24 Elbow, 45° x 3/4 in.  
 25 Nipple, 3/4 x 2 in.  
 26 Manifold bolt, hex-hd, No. 12-24 x 1 3/4 in. (6)  
 27 Washer, lock, No. 12 (6)  
 28 Motor air manifold  
 29 Seal ring (2)  
 30 Live air stud screw  
 31 Washer, lock  
 32 Reverse valve hole stud pin  
 33 Reverse valve hole stud  
 34 Live air stud  
 35 Screw, cap, sq-hd, 5/8-11 x 2 1/2 in. (4)  
 36 Nut, hex, 5/8-11 (4)  
 37 Washer, lock, 5/8 in. (4)  
 38 Worm housing clamp (2)  
 39 Screw, cap, hex-hd, 5/16-24 x 3/4 in. (4)

24 Upper bearing cap  
 25 Lubrication fitting, 1/8 in.  
 27 Screw, cap, hex-hd, 5/16-24 x 3/4 in. (8)  
 28 Washer, lock, 5/16 in. (8)  
 29 Gear case  
 30 Nut, self-locking, hex, 3/8-24 (4)  
 31 Drive gear  
 32 Thrust bearing  
 33 Bearing stud  
 34 Rotary valve  
 35 Cylinder liner key  
 36 Rotary valve bushing  
 37 Grease plug  
 38 Grease plug washer  
 39 Cylinder liner cap (4)

*Figure 6-4(1)—Continued.*

nicks, burrs, and elongated pin holes. Remove minor nicks and burrs with a fine file or handstone. Replace if other damage is evident.

g. Inspect pistons (82) for cracks, nicks, burrs, scoring marks, and out-of-round condition. Check that piston wrist pins (81) have a smooth sliding fit in pistons and connecting rods (93 and 94). Replace pistons if any damage is evident. Do not attempt to repair damaged pistons.

h. Inspect cylinder liners (80) for scoring marks, out-of-round condition, and wear. Using a micrometer or other suitable instrument, check the bore of the cylinder liners. If worn to more than 1.753 inches, replace the cylinder liners.

i. If new pistons (82) or cylinder liners (80) are to be installed, it may be necessary to lap the pistons in the cylinder liners. Use a very fine, mild lapping compound. Install the connecting rod (93 or 94) on the piston to use as a handle. Lap until a smooth, sliding fit is obtained. After lapping, clean parts with an approved solvent to remove all traces of lapping compound.

j. Inspect rotary valve (34) for scoring

k. Inspect rotary valve bushing (36), sprocket and worm spacers (61, 65, and 69) and idler wheel bushings (49) for wear, scoring marks, and out-of-round condition. Replace parts if unserviceable.

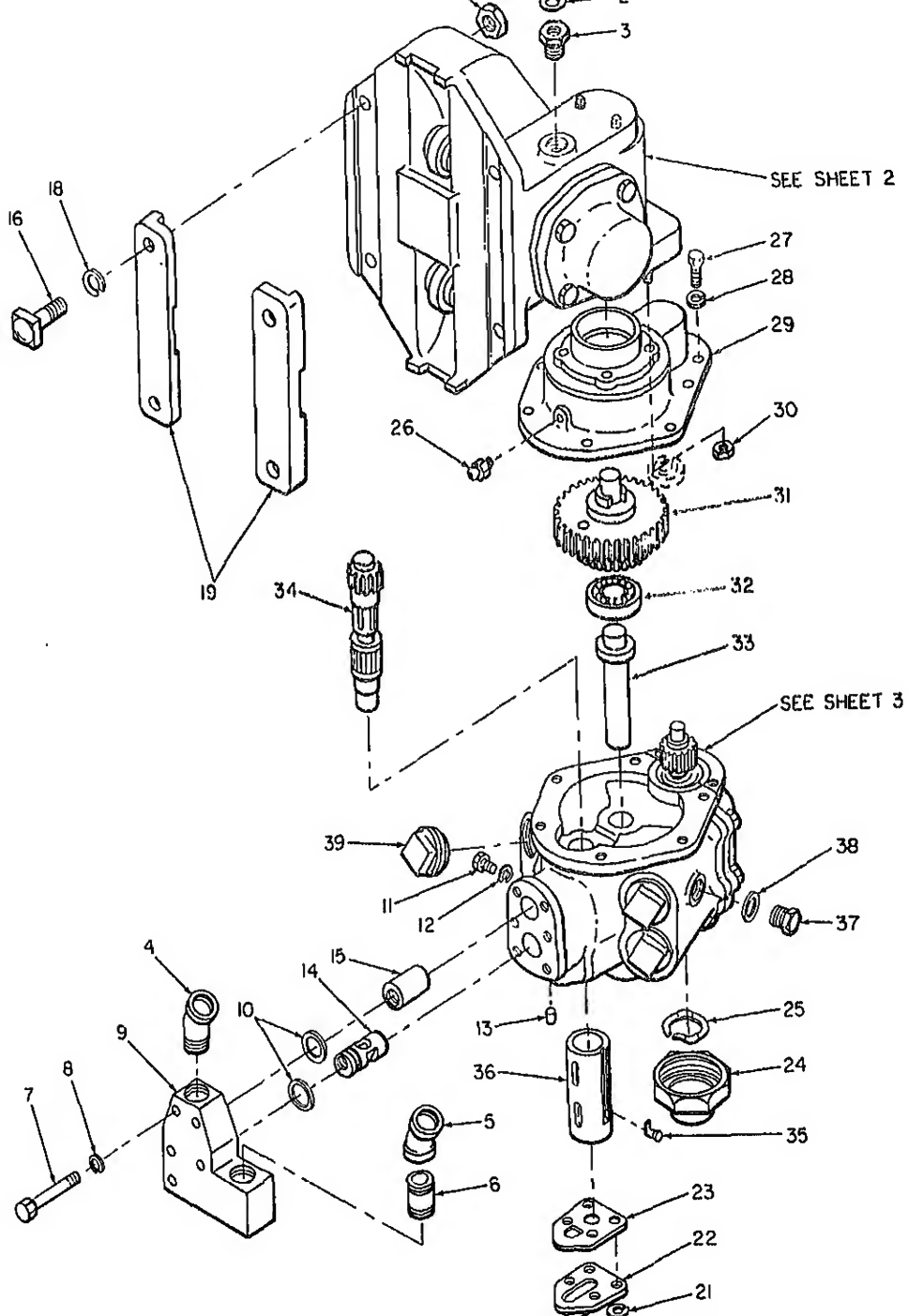
l. Inspect motor air manifold (9), cylinder liner case (96), gear case (29) and worm housing (71) for cracks, breaks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove minor nicks and burrs with a fine file or handstone, and retap or rechase damaged threads. Replace the parts if damage cannot be repaired.

m. Inspect reverse valve hole stud (15), live air stud (15), bearing stud (33), idler wheel shafts (47), sprocket shaft (56), and worm shaft (63) for cracks, wear, and broken threads. Replace parts if unserviceable.

n. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

o. Inspect compression springs (8, fig. 6-3) for damage and distortion. Replace if unserviceable.

p. Replace all O-rings in remote control manifold (fig. 6-3).



Street elbow, 20 x 3/4 in.  
 Elbow, 45° x 3/4 in.  
 Nipple, 3/4 x 2 in.  
 Manifold bolt, hex-hd, No. 12-24 x 1 3/4 in. (5)  
 Washer, lock, No. 12 (5)  
 Motor air manifold  
 Seal ring (2)  
 Live air stud screw  
 Washer, lock  
 Reverse valve hole stud pin  
 Reverse valve hole stud  
 Live air stud  
 Screw, cap, sq-hd, 5/8-11 x 2 1/2 in. (4)  
 Nut, hex, 5/8-11 (4)  
 Washer, lock, 5/8 in. (4)  
 Worm housing clamp (2)  
 Screw, cap, hex-hd, 5/16-24 x 3/4 in. (4)

24 Upper bearing cap  
 26 Lubrication fitting, 1/8 in.  
 27 Screw, cap, hex-hd, 5/16-24 x 3/4 in. (8)  
 28 Washer, lock, 5/16 in. (8)  
 29 Gear case  
 30 Nut, self-locking, hex, 3/8-24 (4)  
 31 Drive gear  
 32 Thrust bearing  
 33 Bearing stud  
 34 Rotary valve  
 35 Cylinder liner key  
 36 Rotary valve bushing  
 37 Grease plug  
 38 Grease plug washer  
 39 Cylinder liner cap (4)

*Figure 6-4(1)—Continued.*

cracks, burrs, and elongated pin holes. Remove minor nicks and burrs with a fine file or handstone. Replace if other damage is evident.

g. Inspect pistons (82) for cracks, nicks, burrs, scoring marks, and out-of-round condition. Check that piston wrist pins (81) have a smooth sliding fit in pistons and connecting rods (93 and 94). Replace pistons if any damage is evident. Do not attempt to repair damaged pistons.

h. Inspect cylinder liners (80) for scoring marks, out-of-round condition, and wear. Using a micrometer or other suitable instrument, check the bore of the cylinder liners. If worn to more than 1.753 inches, replace the cylinder liners.

i. If new pistons (82) or cylinder liners (80) are to be installed, it may be necessary to lap the pistons in the cylinder liners. Use a very fine, mild lapping compound. Install the connecting rod (93 or 94) on the piston to use as a handle. Lap until a smooth, sliding fit is obtained. After lapping, clean parts with an approved solvent to remove all traces of lapping compound.

j. Inspect rotary valve (24) for scoring

k. Inspect rotary valve bushing (36), sprocket and worm spacers (61, 65, and 66), and idler wheel bushings (49) for wear, scoring marks, and out-of-round condition. Replace parts if unserviceable.

l. Inspect motor air manifold (9), cylinder liner cap (96), gear case (29) and worm housing (71) for cracks, breaks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove minor nicks and burrs with a fine file or handstone, and retap or rechase damaged threads. Replace the parts if damage cannot be repaired.

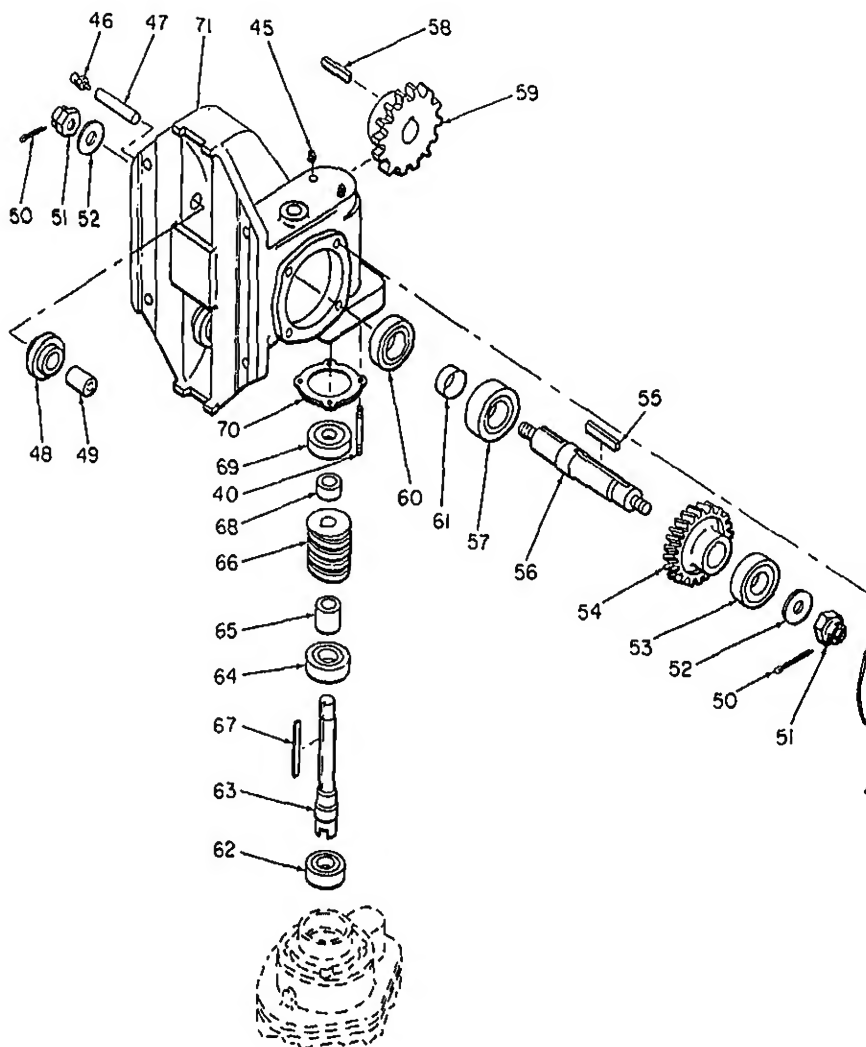
m. Inspect reverse valve hole stud (15), live air stud (15), bearing stud (33), idler wheel shafts (47), sprocket shaft (56), and worm shaft (63) for cracks, wear, and breakage. Replace parts if unserviceable.

n. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

o. Inspect compression springs (8, fig. 6-3) for damage and distortion. Replace if unserviceable.

p. Replace all O-rings in remote control manifold (fig. 6-3).





Housing cap shim  
 Pipe plug, 1/8 in. (2)  
 Lubrication fitting, 1/8 in. (2)  
 Idler wheel shaft (2)  
 Idler wheel (2)  
 Idler wheel bushing (2)  
 Cotter pin (2)  
 Sprocket shaft nut, 5/8-18 (2)  
 Sprocket shaft washer, 5/8 in. (2)  
 Outer worm wheel bearing  
 Worm wheel  
 Worm wheel key

60 Sprocket shaft gear seal  
 61 Sprocket spacer  
 62 Worm shaft grease seal  
 63 Worm shaft  
 64 Inner worm bearing  
 65 Long worm spacer  
 66 Worm  
 67 Worm key  
 68 Short worm spacer  
 69 Outer worm bearing  
 70 Gear case shim  
 71 Worm housing

Figure 6-4(2)—Continued.

### 13. Reassembly

a. *Complete Drill Guide.* Reassemble complete drill guide in reverse of numerical sequence as illustrated on figure 6-7.

b. *Drill Mounting Plate.* Reassemble drill mounting plate in reverse of numerical sequence as illustrated on figure 6-6.

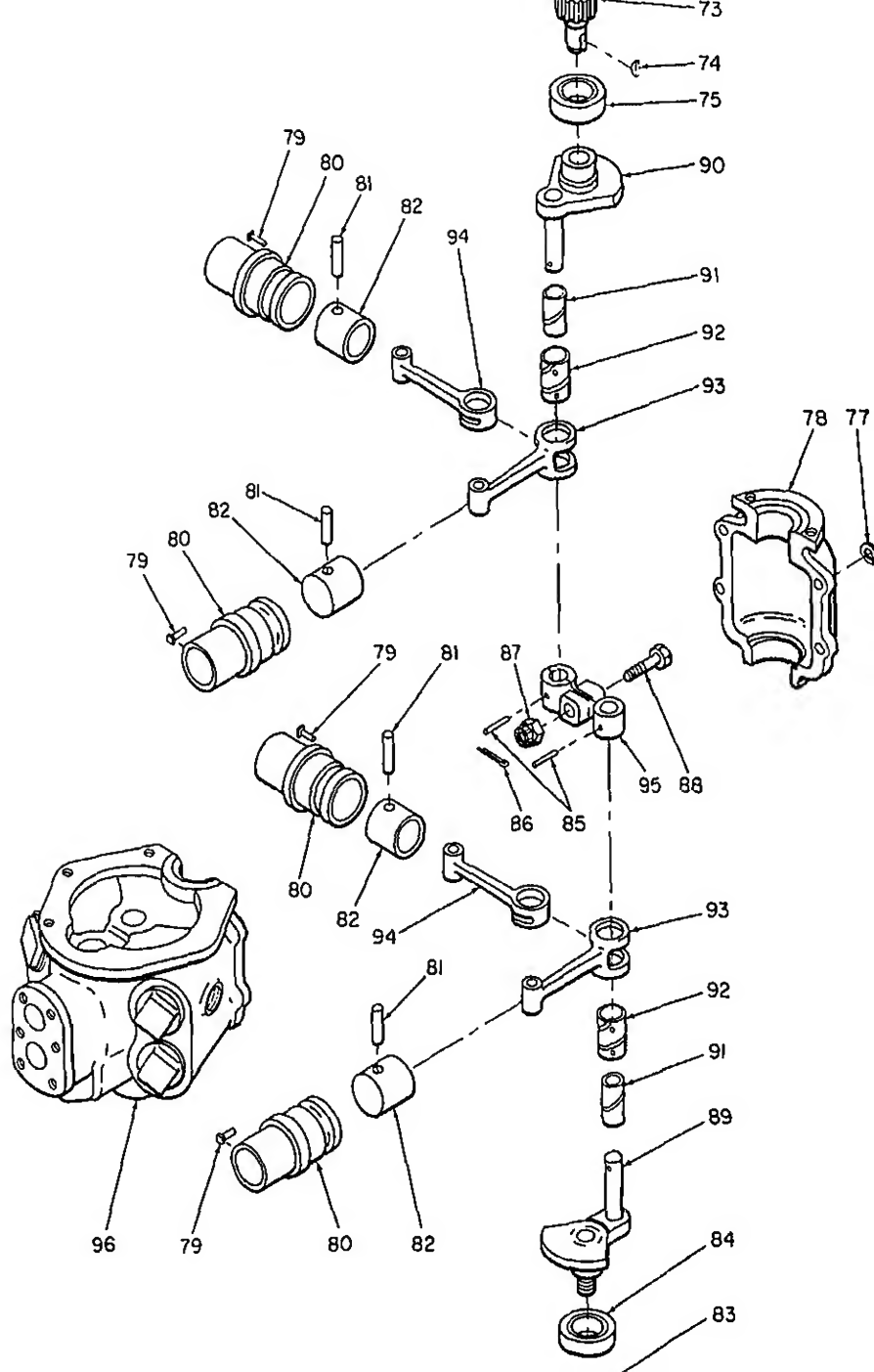
c. *Centralizer.* Reassemble centralizer in reverse of numerical sequence as illustrated on figure 6-5.

d. *Air Feed Motor.* Reassemble air feed motor in reverse of numerical sequence as illustrated on figure 6-4 ((1) through (3)) follow the procedure specified below:

*Note.* Coat all parts with clean engine oil as an aid in reassembly.

- (1) Install cylinder liners (80, fig. 6-4) in cylinder case (96) using cylinder liner keys (79) to align the keyways of the cylinder liners. Use a hammer and wooden block to seat the cylinder liners. Install cylinder liner caps (89).
- (2) Install connecting rods (93 and 94) in pistons (82), and secure with piston wrist pins (81).
- (3) Insert Woodruff key (74) in the keyway of crank pinion (73). Using a suitable bearing pusher to bear on

- (4) Aligning the Woodruff key with slot in lower throw crank (90), install the crank pinion and attach parts.
- (5) Using a suitable bearing pusher bear on the inner race, install upper crank bearing (84) on upper throw crank (89). Install nut (83).
- (6) Mesh an inside connecting rod (93) with an outside connecting rod (94) and press connecting rod bushings (92) into the rods. Repeat the procedure for the other set.
- (7) Install crank pin sleeves (91) on shafts of upper and lower throw cranks (89 and 90), and insert connecting rod bushings, with attached connecting rods and pistons into the crank pin sleeves.
- (8) Insert pinch bolt (88) through wrong side of crank center piece to spread the web.
- (9) Insert the assembled throw crank into crank center piece (95) so that the "X" marked on the end of crank and the crank center piece matched. Align the pin holes and lightly tap in crank pins (85). Move the pinch bolt (88) and insert

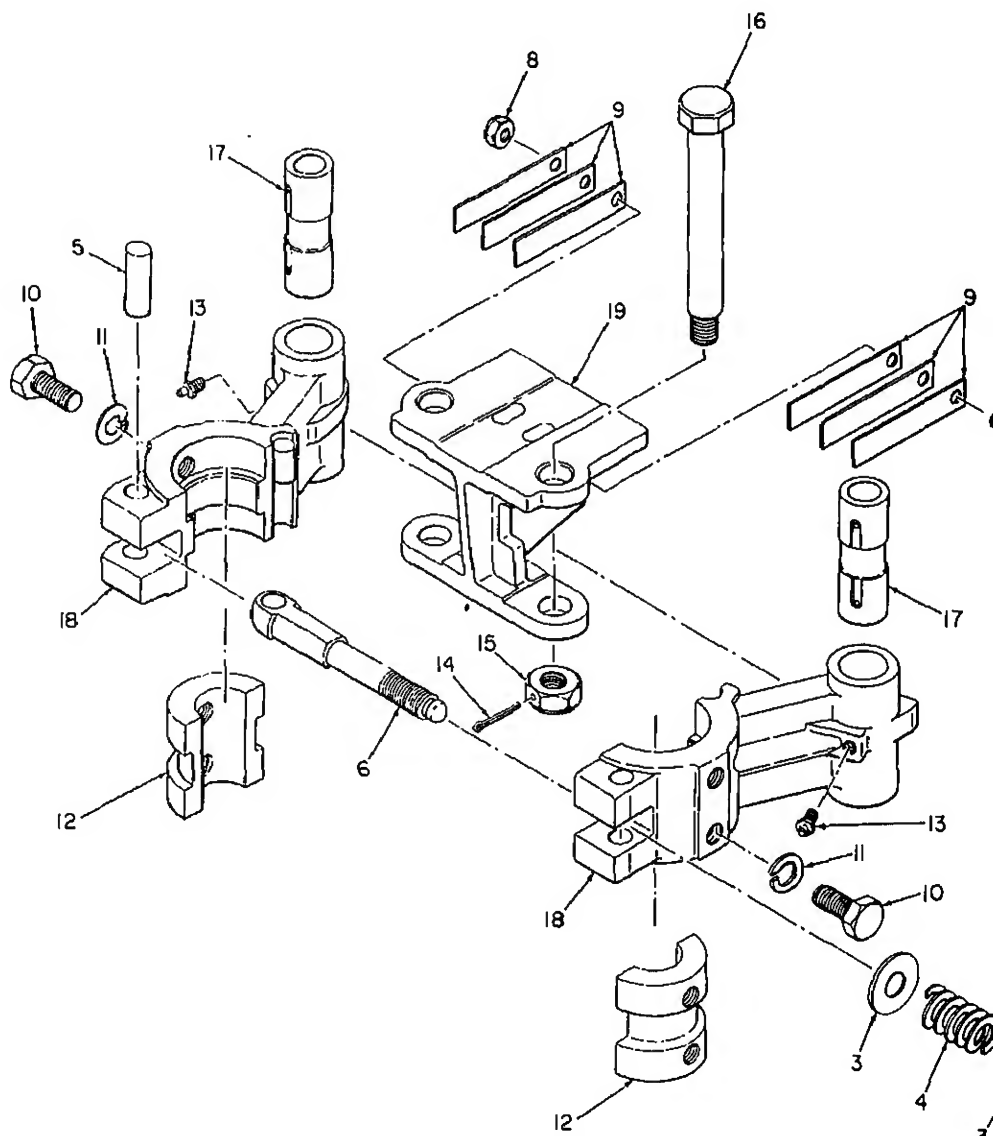


Screw, cap, hex-hd, 5/16-24 x 3/4 in. (4)  
 Washer, lock, 5/16 in. (4)  
 Crank shaft cap  
 Cylinder liner key (4)  
 Cylinder liner (4)  
 Piston wrist pin (4)  
 Piston (4)  
 Nut, hex, 9/16-20  
 Upper crank bearing

89 Upper throw crank  
 90 Lower throw crank  
 91 Crank pin sleeve (2)  
 92 Connecting rod bushing (2)  
 93 Outside connecting rod (2)  
 94 Inside connecting rod (2)  
 95 Crank center piece  
 96 Cylinder case

Figure 6-4(3)—Continued.

- crank pins (85) and bend over the ends of the cotter pin.
- (10) Install the assembled crank parts into cylinder case (96), being careful not to damage the pistons (82). Tilt the crank as necessary to allow each piston to enter its cylinder liner (80).
- (11) Install crank shaft cap (78).
- (12) Press idler wheel bushings (49) into idler wheels (48). Position the idler wheels in the recess of worm housing (71) and press idler wheel shafts (47) through the housing and the bushings. Install lubrication fittings (46) on the idler wheel shafts.
- (13) Insert worm wheel key (55) in the slot of sprocket shaft (56). Align the keyway of worm wheel (54) with the key, and press the worm wheel onto the shaft.
- (14) Using a suitable bearing pusher to bear on the inner races, press inner and outer worm wheel bearings (57 and 53) onto sprocket shaft (56).
- (15) Install sprocket shaft washer (52) and sprocket shaft nut (51) on the worm wheel end of sprocket shaft (56). Install cotter pin (50) and bend over the ends to lock the nut.
- (16) Install sprocket spacer (61) and sprocket shaft gear seal (60) on the sprocket end of sprocket shaft (56).
- (17) Insert sprocket key (58) in the slot of sprocket fits over the shaft and the keyway is aligned with the key. Secure the parts by installing sprocket shaft washer (52), sprocket shaft nut (51) and cotter pin (50).
- (18) Install housing cap shim (44) and housing cap (43), and secure with screws (41) and lock washers (42).
- (19) Using a suitable bearing pusher to bear on the inner race, install inner worm bearing (64) on worm shaft (63). Install long worm spacer (65). Insert worm key (67) in the slot of worm shaft (63), and install worm bearing (66) over the key on the shaft. Install short worm spacer (68).
- (20) Using a suitable bearing pusher to bear on the inner race, install outer worm bearing (69) on worm shaft (63).
- (21) Install the assembled worm shaft parts (62 through 69) in worm housing (71), turning the shaft to engage worm (66) with worm wheel (54).
- (22) Install worm housing studs (40) and place gear case shim (70) over the studs on the machined surface of worm housing (71).
- (23) Install pipe plugs (45).
- (24) Install worm shaft grease seal (62) in the upper (worm housing) end of



Centralizer swing bolt pin  
 Centralizer swing bolt  
 Screw, cap, hex-hd, 8/8-16 x 3 1/2 in.  
 Nut, self-locking hex, 8/8-16  
 Centralizer arm spring (6)  
 Screw, cap, hex-hd, 6/8-18 x 1 1/2 (4)

15 Nut, hex, slotted, 7/8-14 (2)  
 16 Centralizer arm bolt, 7/8-14 x 7 3/8 in. (2)  
 17 Centralizer arm bolt bushing (2)  
 18 Centralizer arm (2)  
 19 Centralizer bracket

Figure 6-5—Continued.

- (26) Press rotary valve bushing (36) into cylinder case (96) through the exhaust cover opening. Make sure that the keyway in the bushing is aligned with cylinder liner key (85). Ream the bushing if necessary.
- (27) Install rotary valve (84) into cylinder case (96).
- (28) Using a suitable bearing pusher to bear on the inner race, press thrust bearing (32), with the stamped marking THRUST HERE facing outward (away from the cylinder case), onto bearing stud (33). Press the bearing stud into the cylinder case (96).
- (29) Rotate the crank assembly (in the cylinder case) until the 1/16-inch milled cut in crank pinion (73) is closest to bearing stud (33). Align drive gear (31) on thrust bearing (32) so that the gear tooth marked with an arrow engages the milled cut in the crank pinion (fig. 6-8). Insert a suitable piece of wire or a nail through the hole in the drive gear, and rotate the rotary valve (84, fig. 6-4) until the nail engages the hole in the rotary valve pinion (see fig. 6-8). When these criteria are met, seat the drive gear so that it meshes with crank pinion (73, fig. 6-4) and the pinion of rotary valve (84).
- (30) Install crank pinion bearing (72) over drive gear (31) onto the shaft of crank pinion (73).

- (31) Install upper bearing spring (25) and upper bearing cap (24). Install thrust plate (23) and exhaust cover (22).
- (32) Install reverse valve hole stud (14) and live air stud (15) into cylinder case (96). Install seal rings (10) in motor air manifold (9).
- (33) Secure motor air manifold (9) to cylinder case (96).
- (34) Secure the assembled worm housing (71) and gear case (29) to cylinder case (96).
- (35) If the air feed motor is to be installed immediately, do not install worm housing clamps (19) until the motor is mounted on the drill guide.

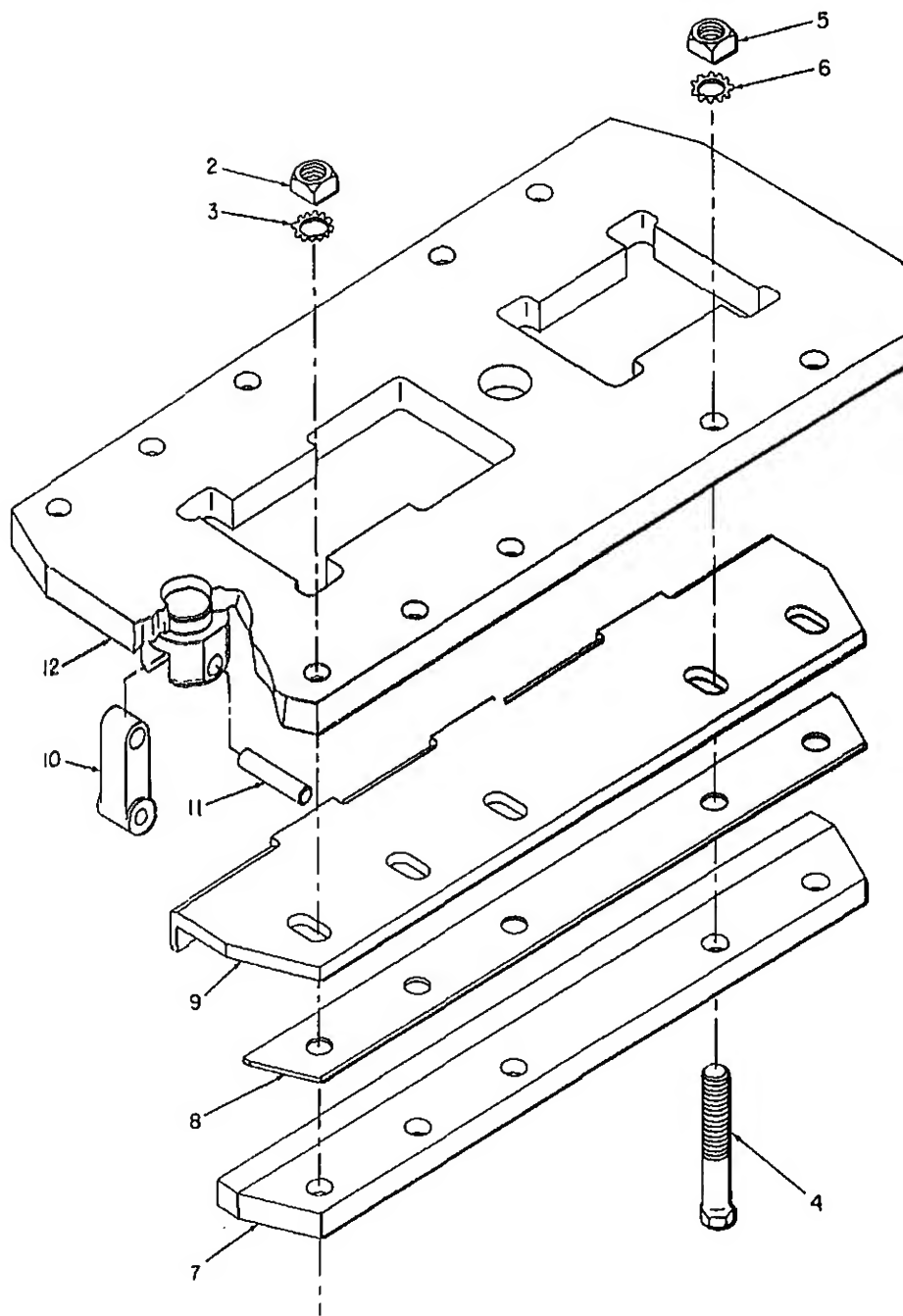
*Note.* If pistons (82) or cylinder liner (80) are replaced, it is recommended that the air feed motor be operated at approximately half-speed for several hours, to run in the parts.

*e. Remote Control Manifold.* Reassemble remote control manifold in reverse of numerical sequence as illustrated on figure 6-3.

*f. Complete Drill Mounting.* Reassemble complete drill mounting in reverse of numerical sequence as illustrated on figure 6-2.

## 6-14. Installation

Install the complete drill mounting as described in paragraph 5-12b.



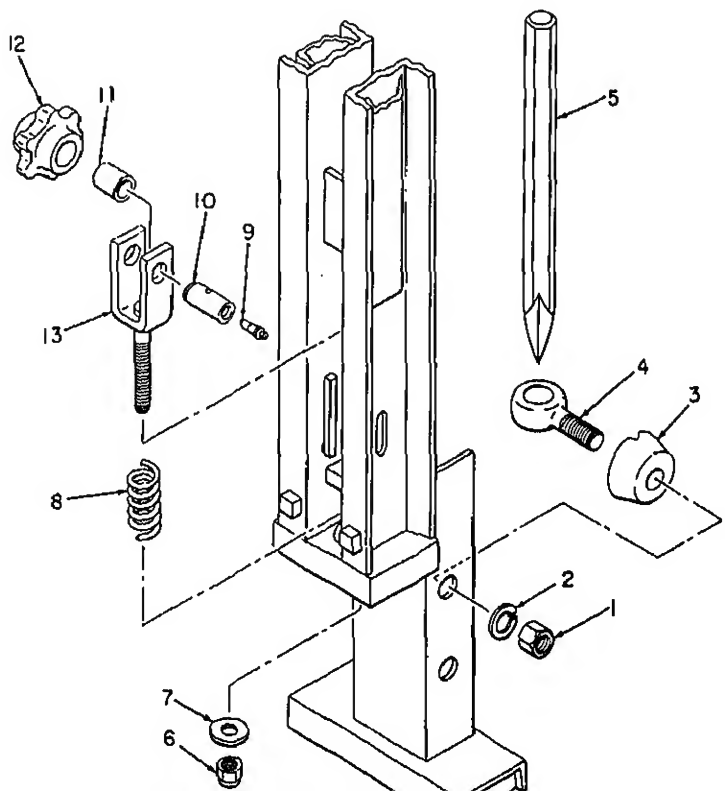
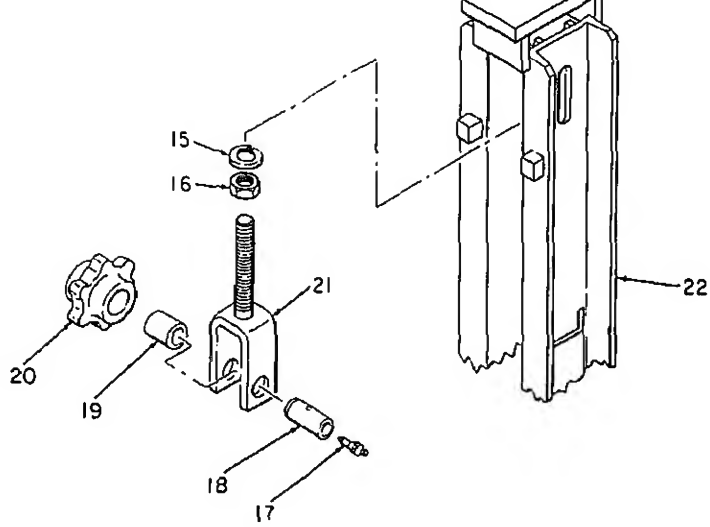
nut, square, 6/8-11 (2)  
washer, lock, external tooth, 5/8 in. (2)

11 Link pin (2)  
12 Drill mounting plate

*Figure 6-6—Continued.*

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Foot piece pointer  
Nut, self-locking hex, 3/4-10  
Washer, flat, 3/4 in.  
Spring  
Lubrication fitting  
Sprocket shaft  
Tower sprocket bearing

16 Nut, jam, 3/4-10  
17 Lubricating fitting  
18 Sprocket shaft  
19 Tower sprocket bearing  
20 Tower sprocket  
21 Sprocket yoke  
22 Drill guide

Figure 6-7—Continued.

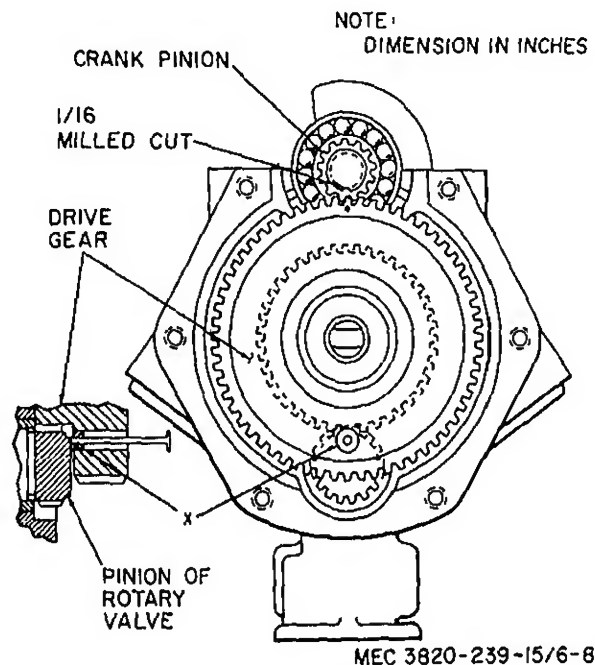


Figure 6-8. Air feed motor, valve timing details.

### Section III. HYDRAULIC PUMP ASSEMBLY

#### 15. General

This section contains repair instructions for the hydraulic pump assembly. The assembly consists essentially of an air motor which drives the hydraulic pump through a flexible coupling. The pump provides all of the hydraulic power to drive the hydraulic cylinders, which position the boom and drill guide.

#### 6-17. Disassembly

a. General. Disassemble hydraulic pump assembly in the numerical sequence as illustrated on figure 6-9. Note the following special procedures.

- (1) Rotate flexible coupling (14, figure 6-9) until setscrews (1) are visible. Loosen both setscrews.
- (2) Remove screws (10), nuts (11), and

b. *Hydraulic Pump.* Disassemble hydraulic pump in the numerical sequence as illustrated on figure 6-10. Note the following special procedures:

- (1) Mark the position of cover (2, fig. 6-10) with respect to body (17) before removal, so that the parts will be assembled with the proper orientation.
- (2) Pull pressure plate (4), spring (3), pins (5), ring (7), and rotor (8) off drive shaft (16).

*Note.* Mark the position of ring (7) and pins (5) to facilitate assembly.

- (3) Remove and discard O-rings (6).
- (4) Remove snap ring (10). Using a mallet, tap on the end of drive shaft (16), to free the shaft with assembled parts from body (17).

*Note.* Bearings (11 and 13), seal (14), and spacer (15) are press-fitted on drive shaft (16).

- (5) Using a suitable bearing puller, remove bearing (11) from drive shaft (16).
- (6) Remove bearing (13) from body (17) by tapping it out with a drift punch.

*Note.* Do not remove seal (14) from drive shaft (16) unless it is damaged. The seal must be replaced once it is removed.

- (7) If required, tap key (12) out of the slot in drive shaft (16).

c. *Air Motor.* Disassemble air motor in the numerical sequence as illustrated on figure 6-11. Note the following special procedures:

- (1) After removing housing cover (4, fig. 6-11), loosen the motor in the housing by tapping the end of motor pinion (14) with a mallet. Remove the assembled parts from motor housing (19).

- (2) Hold the assembly in an upright position by clamping motor pinion (14)

drive on the end of the pinion (14). The rotor (15) is freed from bearing, rear end plate (11), and vanes (13) from the rotor.

- (5) Support front end plate (11) as closely as possible to the center of rotor (15), and remove end of motor pinion (14) from ball bearing (16) and pressure plate are freed.

- (6) Only if replacement of pinion (14) or rotor (15) is required, support the front face of the pinion and insert a steel rod perpendicular to the bore of the rotor. Tighten rod until the motor pinion is seated.

## 6-18. Cleaning

Clean all parts with an appropriate solvent and blow dry with compressed air.

**Caution:** Do not spin ball bearings with compressed air.

## 6-19. Inspection and Repair

a. Inspect bearings (11 and 13, fig. 6-11) for roughness and binding while rotating. Replace bearings if these defects are found.

b. Inspect vanes (9, fig. 6-11) for chips and wear. If any damage is found, replace vanes. If replacement, use a complete set of vanes from the hydraulic pump or 5 for the air motor.

c. Inspect rotors (8, fig. 6-11) for cracks, scores, and rough spots. Remove rough spots and score with a piece of emery cloth. Replace if damaged.

d. Inspect cylinder (12, fig. 6-11) for cracks, nicks, and burrs on the face. Check that the bore is smooth. Remove slight nicks and burrs using a fine sandpaper. Polish the bore with a fine sandpaper.

e. Inspect housings and covers for cracks, nicks and burrs on machined surfaces, and for stripped and crossed threads. Remove nicks and burrs with a fine file or handstone. Retap or rechase damaged threads.

f. Inspect gaskets (5 and 18, fig. 6-11). Replace if worn, frayed, or otherwise damaged. Replace O-rings (6, fig. 6-10) regardless of condition.

g. Inspect all hardware for damaged threads. Retap or rechase all stripped and crossed threads. Replace if unserviceable.

h. Inspect end plates (10 and 17, fig. 6-11) for scratches or score marks on the faces. Remove slight damage by rubbing the plate on a piece of emery cloth placed on a smooth flat surface. If plates are badly scored or scratched, replace them.

## 20. Reassembly

a. *Air Motor.* Reassemble air motor by carefully following the step-by-step procedure given below:

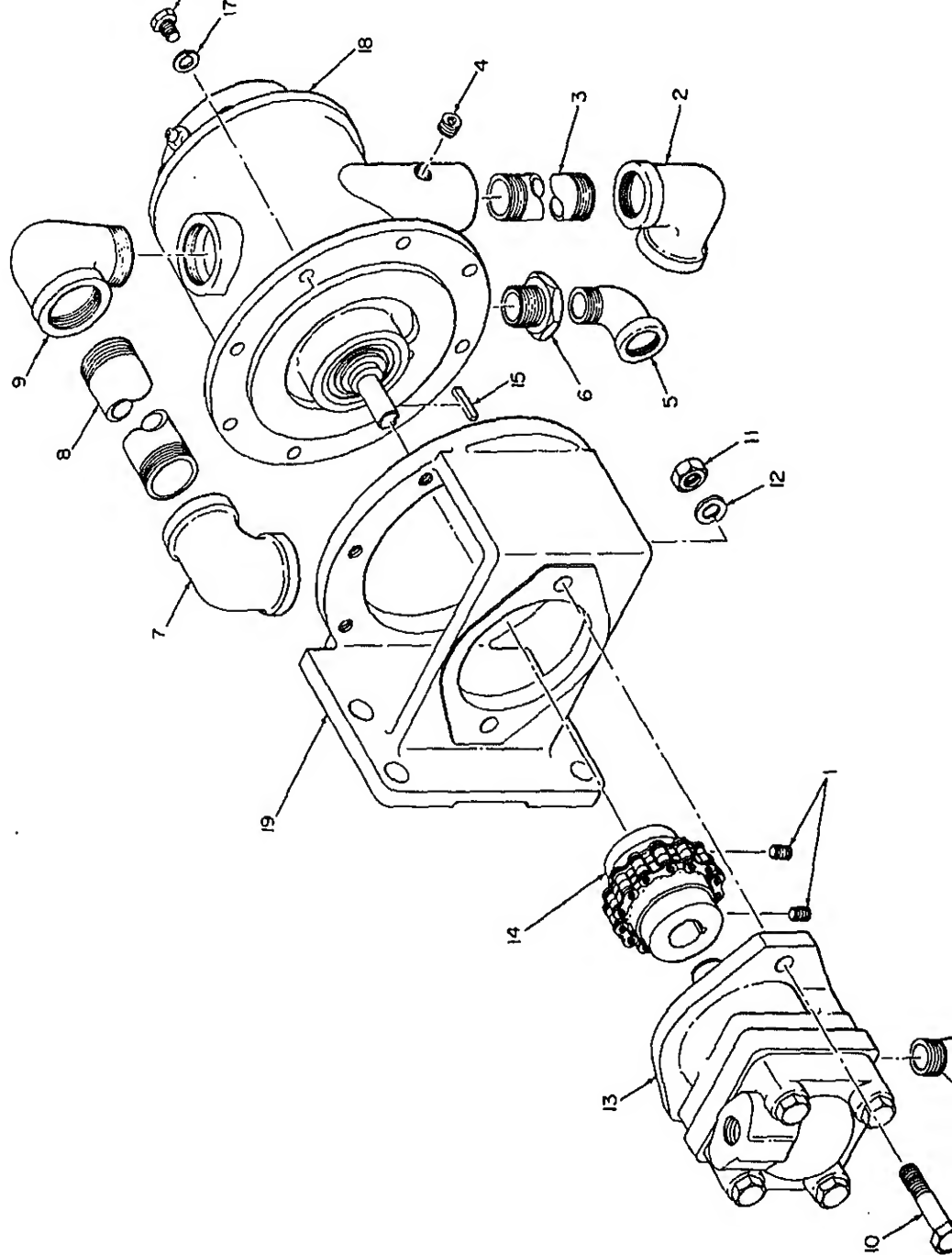
- (1) Place front end plate (17, fig. 6-11) on the bed of an arbor press. Start front ball bearing (16) squarely into the recess in the plate. Using the arbor press to bear only on the outer race of the bearing, press it in until seated.
- (2) Stand rotor (15) on the arbor press. Using the press to bear only on the inner race of front ball bearing (16), press the bearing and end plate onto the rotor.

**Caution:** Do not allow the end plate to bind against the rotor.

- (3) If motor pinion (14) was removed from rotor (15), align the serrations in the pinion shank with the rotor and press the pinion in up to the

Make sure that the cylinder is installed correctly (when facing the air port in the cylinder, the dowel hole is to be to the right of the air port). Reverse the cylinder position if necessary.

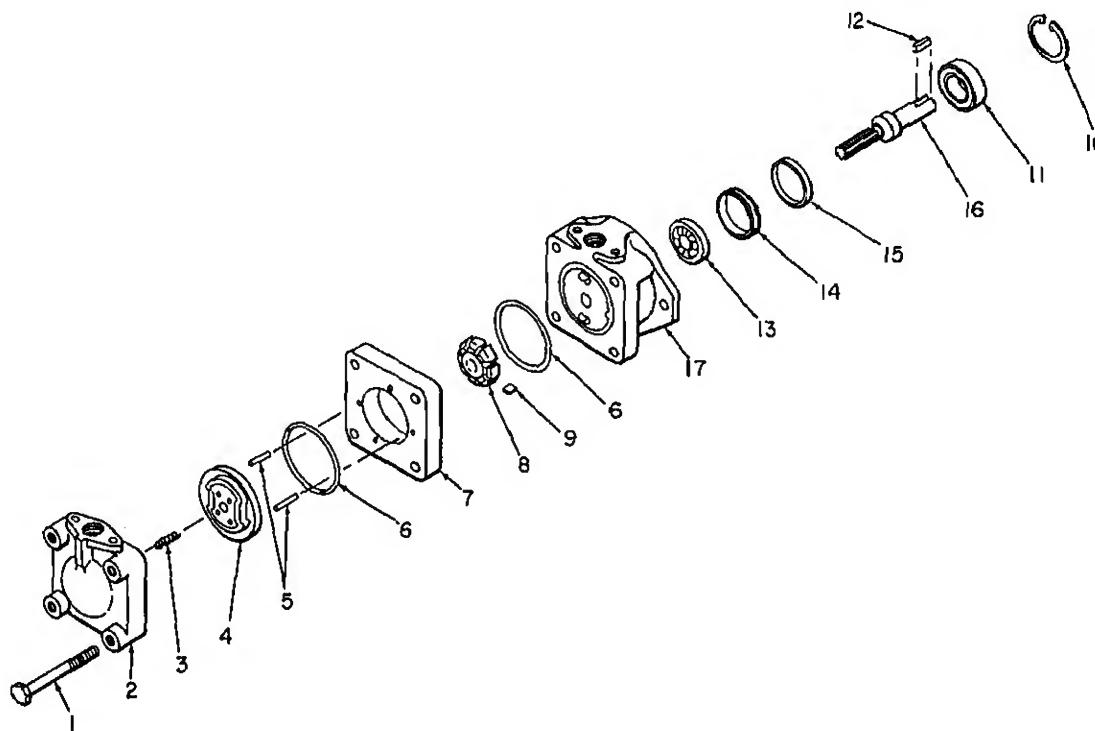
- (6) Install rotor bearing spacer (11) (chamfered side first) on shaft of rotor (15).
- (7) Install rear ball bearing (9) (shallow side first) in rear end plate (4) in the same manner as step (1).
- (8) Stand rotor (15) with assembled parts on the bed of an arbor press. Position rear end plate (10), bearing side up, over the rotor, and using the arbor press to bear only on the bearing inner race, press the rear end plate on until the bearing contacts the rotor bearing spacer (11).
- (9) Install rotor bearing spring (7) over rear ball bearing (9) so that the spring prongs contact the bearing outer race.
- (10) Install the left-hand threaded rotor lock screw securely.
- (11) Install air port gasket (18), large open end first, into the air inlet slot of motor housing (19) (fig. 6-11).
- (12) Align the dowel holes in rear end plate (10) and front end plate (17) with those in cylinder (12), and insert a 1/4-inch diameter rod at least 6 inches long, into the dowel hole, allowing the rod to protrude from the front end plate.
- (13) Insert the rod into the dowel hole in motor housing (19) and slide the assembled motor parts into the housing. If necessary, tap the flanged face of the motor housing with a mallet to securely seat the motor assembly.
- (14) Remove the rod and install cylinder



- Street elbow, 90° x 1 1/2 in. (2)
- Reducing bushing, 3/4 to 1/2 in.
- Elbow, 90° x 1 in.
- Nipple, 1 x 6 in.
- Street elbow, 90° x 1 in.
- Screw, cap, hex-hd, 3/8-16 x 1 1/2 in. (2)

- Square key, 1/8 x 3/4 in.
- Screw, cap, hex-hd, 5/16-18 x 7/8 in. (8)
- Washer, lock, 5/16 in. (8)
- Air motor
- Pump mounting housing

Figure 6-9—Continued.

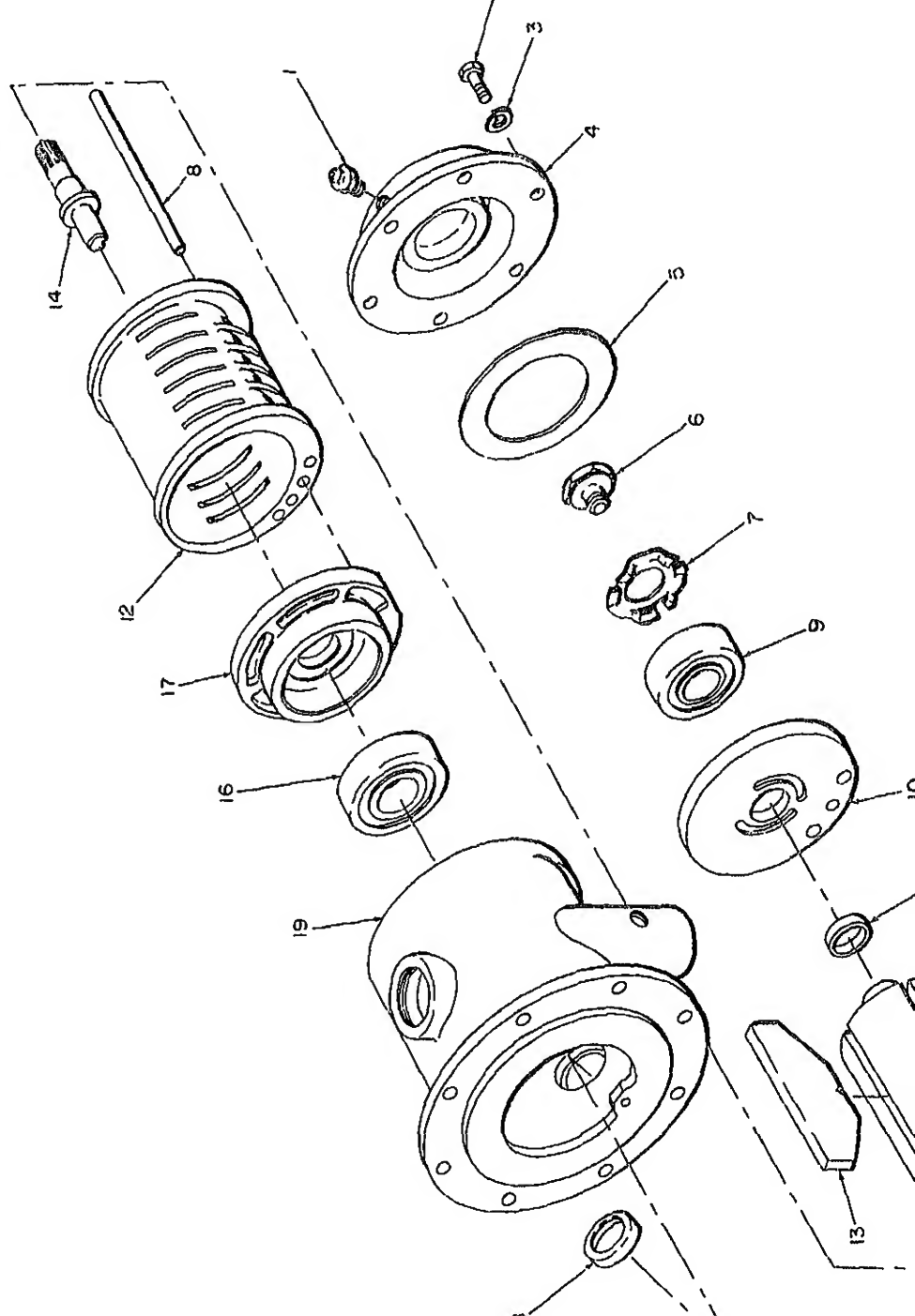


MEC 3820-239-15/6

- Screw, hex-hd, 3/8-16 x 2 1/4 in. (4)
- Cover
- Spring
- Pressure plate
- Pin (2)
- O-ring (2)
- Ring
- Rotor
- Vane (12)

- Snap ring
- Bearing
- Key
- Bearing
- Seal
- Spacer
- Drive shaft
- Body

Figure 6-10. Hydraulic pump, exploded view.



15 Rotor  
16 Front ball bearing  
17 Front end plate  
18 Air port gasket  
19 Motor housing

8 Cylinder dowel  
9 Rear ball bearing  
10 Rear end plate  
11 Rotor bearing spacer  
12 Cylinder  
13 Vane (5)  
14 Motor pinion

semit fitting, 1/8 in.  
screw, cap, hex-hd 1/4-20 x 3/4 in. (6)  
washer, lock, 1/4 in. (6)  
housing cover  
housing cover gasket  
motor lock screw  
motor bearing spring

Figure 6-11—Continued.



pump by carefully following the step-by-step procedure given below:

- (1) Before assembling, dip all parts in clean hydraulic oil. This will facilitate assembly, and provide adequate initial lubrication.
- (2) Using a suitable bearing pusher to bear on the inner race of bearing (11, fig. 6-10), install the bearing on drive shaft (16).
- (3) Using a suitable bearing pusher to bear on the outer race of bearing (13), install the bearing in body (17).
- (4) Install spacer (15), seal (14), and key (12) on drive shaft (16).

*Note.* Make sure the seal is installed with the sealing lip facing the key end of the shaft, to prevent the entry of air into the system.

- (5) Slide the assembled drive shaft (16) into body (17) until seated in bearing (13). Tap the drive shaft lightly with a mallet if necessary, to seat the parts.
- (6) Using retaining ring pliers, install snap ring (10).
- (7) Insert an O-ring (6) in the groove of body (17) and cover (2). Make sure the O-rings are seated properly to prevent leakage.
- (8) Install ring (7) in the proper position as marked during disassembly, and secure with pins (5).

- (11) Install cover (2) in the position as marked during disassembly and tighten screws (1) to 22 to 28 foot-pound.

*Note.* Check that the pump is free by hand. If the pump is stiff, bleed and determine the cause.

*c. Hydraulic Pump Assembly*  
Install the hydraulic pump assembly in reverse sequence as illustrated on figure 6-9. The following special procedure should be followed:

- (1) After securing air line (19, fig. 6-9) to pump motor shaft (19), loosen setscrew (14) on coupling (14). Make sure key (15) is installed in pump motor shaft, and slide coupling onto the shaft and tighten setscrew.
- (2) Make sure that key (12) on pump (13) is installed in body (17) and insert the pump shaft into the keyway of coupling (14). Install screw (11), and lock washer (11), and tighten the setscrew (1) to 22 to 28 foot-pound.
- (3) Install elbows and fittings on figure 6-9.

## 6-21. Installation

Install the hydraulic pump assembly as described in paragraph 3-44.

## Section IV. HYDRAULIC VALVE ASSEMBLY

### 6-22. General

This section contains repair instructions for the hydraulic valve assembly. The hydraulic valve assembly contains the controls for operating the hydraulic cylinders to position the boom and the drill guide (fig. 1-5).

### 6-23. Removal

Remove the hydraulic valve assembly as described in paragraph 3-58.

### 6-24. Disassembly

*a. Hydraulic Valve Assembly*  
Remove the hydraulic valve assembly in the following sequence:

valve in the numerical sequence as illustrated on figure 6-13.

*Note.* Label each valve section as the parts are removed, and do not intermix spools (16, fig. 6-13) since they are individually fitted to the bores.

## **6-25. Cleaning**

Clean all parts in an approved solvent and blow dry with compressed air. Be sure to thoroughly clean out and dry all internal passages in body (20, fig. 6-13).

## **6-26. Inspection and Repair**

- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damaged

spacers.

- d. Do not attempt to rework damaged (16, fig. 6-13) as this will result in leakage and pressure loss.

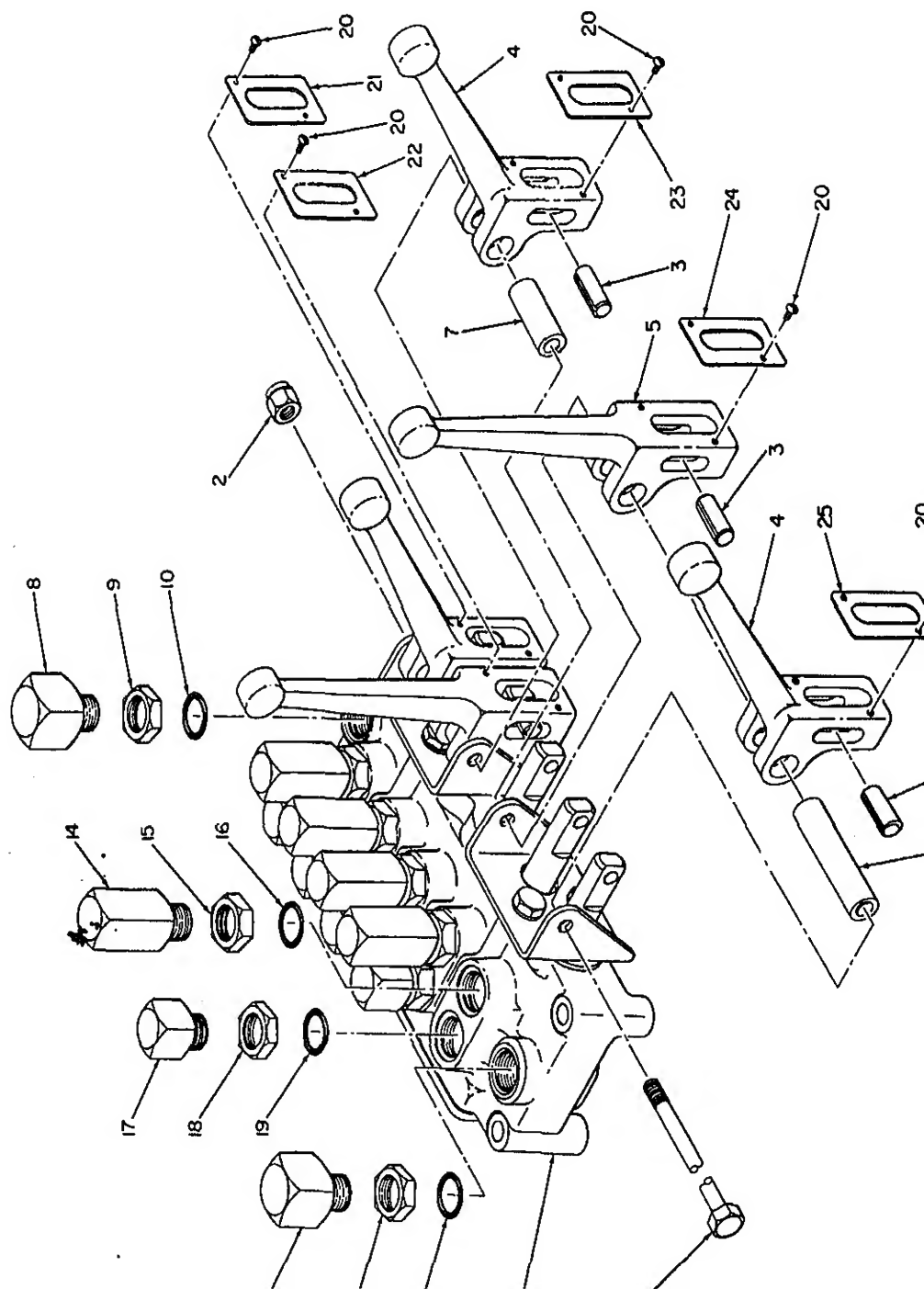
## **6-27. Reassembly**

a. *Hydraulic Valve.* Reassemble hydraulic valve in reverse of numerical sequence illustrated on figure 6-13.

b. *Hydraulic Valve Assembly.* Reassemble hydraulic valve assembly in reverse of numerical sequence as illustrated on figure 6-

## **6-28. Installation**

Install the hydraulic valve assembly as described in paragraph 3-59.

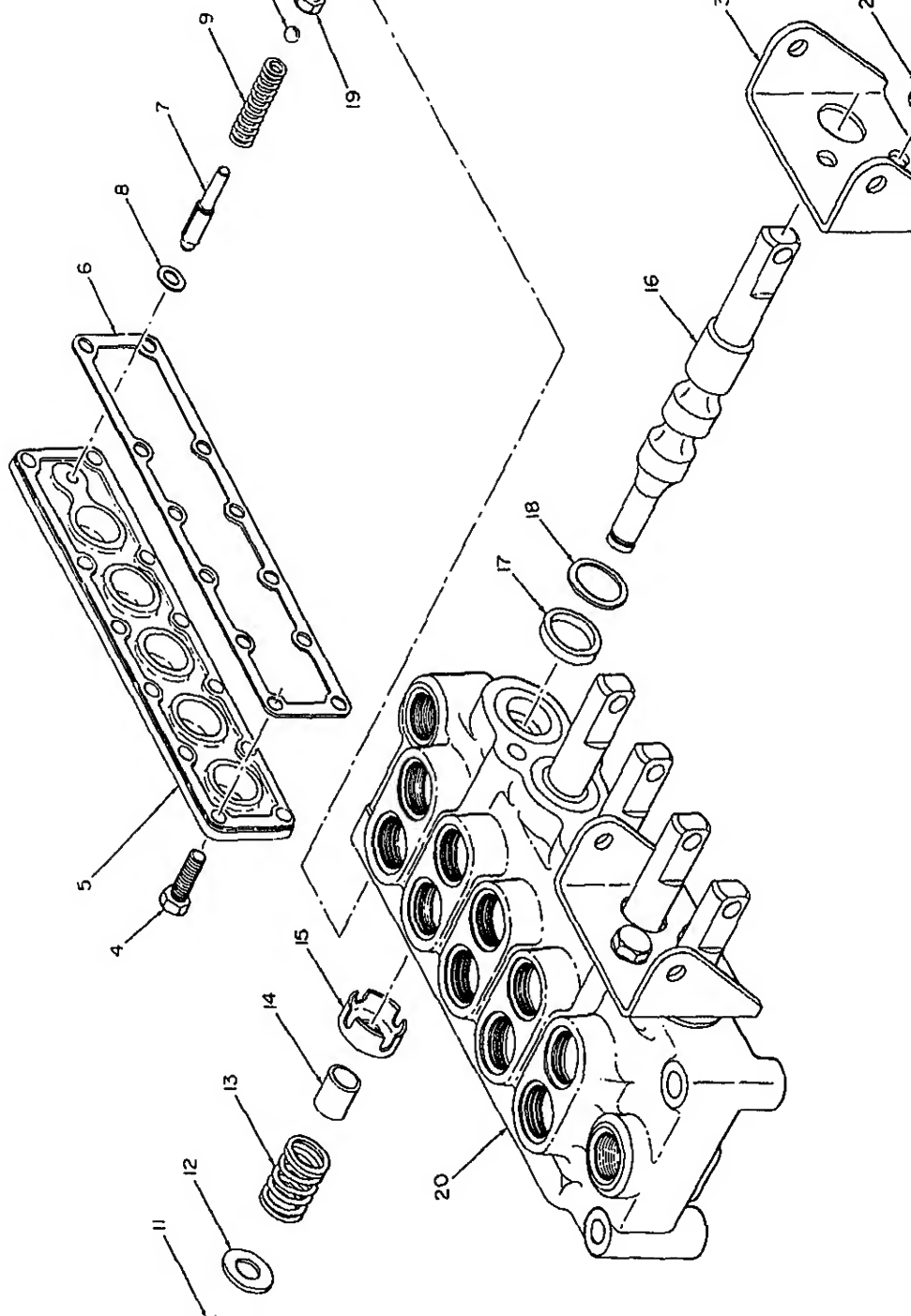


11 Locking, nut, 3/8-10  
 pin (5)  
 valve lever (3)  
 valve lever (2)  
 spacer bushing (2)  
 spacer bushing  
 fitting  
 nut

12 Lock nut  
 13 O-ring  
 14 Boss fitting (5)  
 15 Lock nut (5)  
 16 O-ring (5)  
 17 Boss fitting (5)  
 18 Lock nut (5)

21 Boom lift nameplate  
 22 Boom swing nameplate  
 23 Guide dump cylinder nameplate  
 24 Guide swing cylinder nameplate  
 25 Guide extension cylinder nameplate  
 26 Hydraulic valve

Figure 6-12—Continued.



7, cap, hex-hd, 3/8-16 x 5/8 in. (4)	8 Pressure adjusting shim (as rqr)	15 Cup washer (5)
er, lock, 3/8 in. (4)	9 Relief spring	16 Spool (5)
bracket (2)	10 Relief ball	17 V-ring packing (5)
er, cap, hex-hd, 1/4-20 x 5/8 in. (12)	11 Retaining ring (5)	18 Back-up ring (5)
cover	12 Spool washer (5)	19 Relief seat
cover gasket	13 Spool return spring (5)	20 Body
pin	14 Spool stop (5)	

Figure 6-13—Continued.

the main air valve and manifold lubricator. The main air valve is the on-off control for the air supply from the compressor. The manifold lubricator injects a preset quantity of rock drill oil into the air stream to provide lubrication for the air motors and drifter drill.

### **6-30. Removal**

Remove the main air valve and manifold lubricator as described in paragraph 3-49.

### **6-31. Disassembly**

*a. Main Air Valve.* Disassemble main air valve in the numerical sequence as illustrated on figure 6-14.

*b. Manifold Lubricator.* Disassemble manifold lubricator in the numerical sequence as illustrated on figure 6-15.

and blow dry with compressed air.

### **6-33. Inspection and Repair**

- a.* Inspect all parts for wear and damage.
- b.* Inspect all hardware for damaged threads. Retap or rechase threads if stripped, crossed, or replace if unserviceable.
- c.* Replace all O-rings.

### **6-34. Reassembly**

*a. Main Air Valve.* Reassemble main air valve in reverse of numerical sequence as illustrated on figure 6-14.

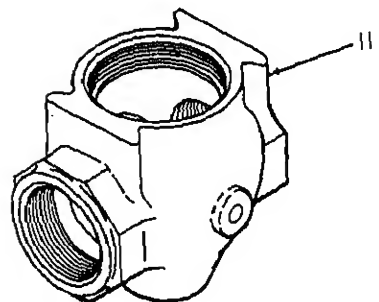
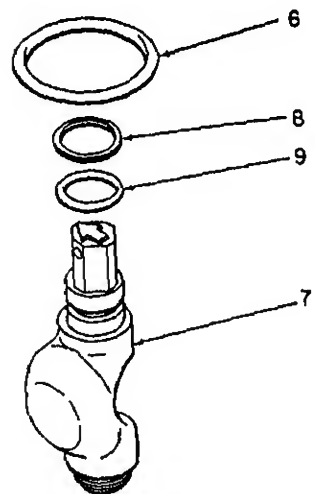
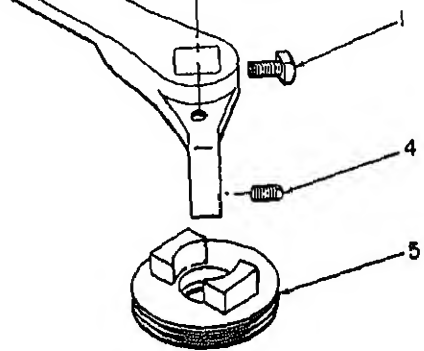
*b. Manifold Lubricator.* Reassemble manifold lubricator in reverse of numerical sequence as illustrated on figure 6-15.

### **6-35. Installation**

Install the main air valve and manifold lubricator as described in paragraph 3-50.

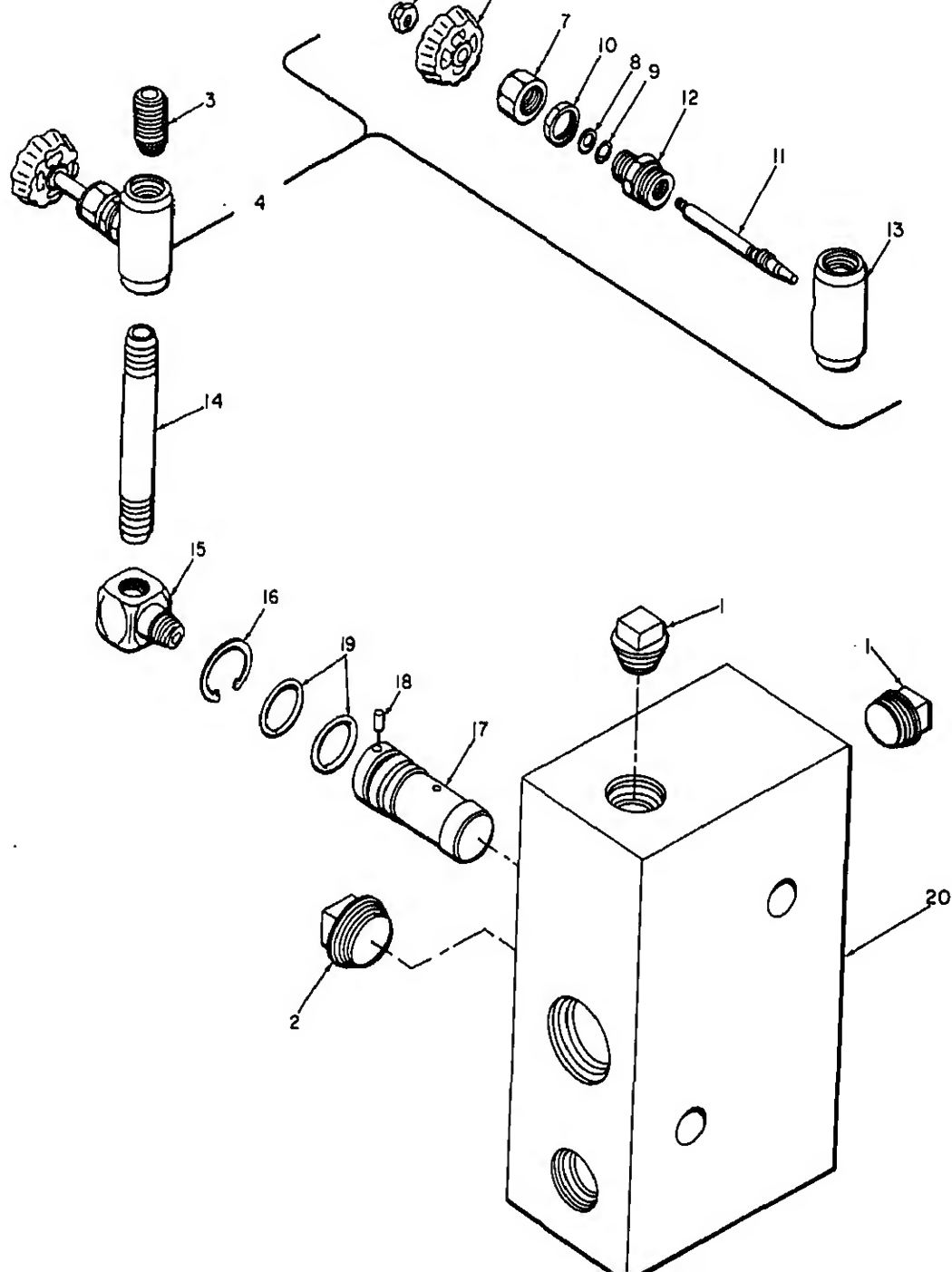






*Figure 6-14—Continued.*

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Needle valve  
5 Acorn nut  
6 Handwheel  
7 Packing nut  
8 Packing washer  
9 O-ring  
10 Mounting nut

14 Nipple  
15 Elbow  
16 Retaining ring  
17 Differential pressure nozzle  
18 Dowel pin  
19 O-ring (2)  
20 Bare manifold lubricator

Figure 6-15—Continued.

## Section VI. PROPELLING CONTROL VALVES

### 6-36. General

This section contains repair instructions for the propelling control valves. The propelling control valves supply air to the propelling air motors to tram the pneumatic drill either forward or reverse. There are two valves used, one for each traction drive, and quantities specified throughout this section are for one valve.

### 6-37. Removal

Remove the propelling control valves as described in paragraph 3-61.

### 6-38. Disassembly

Disassemble propelling control valve in the numerical sequence as illustrated on figure 6-16.

### 6-39. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

### 6-40. Inspection and Repair

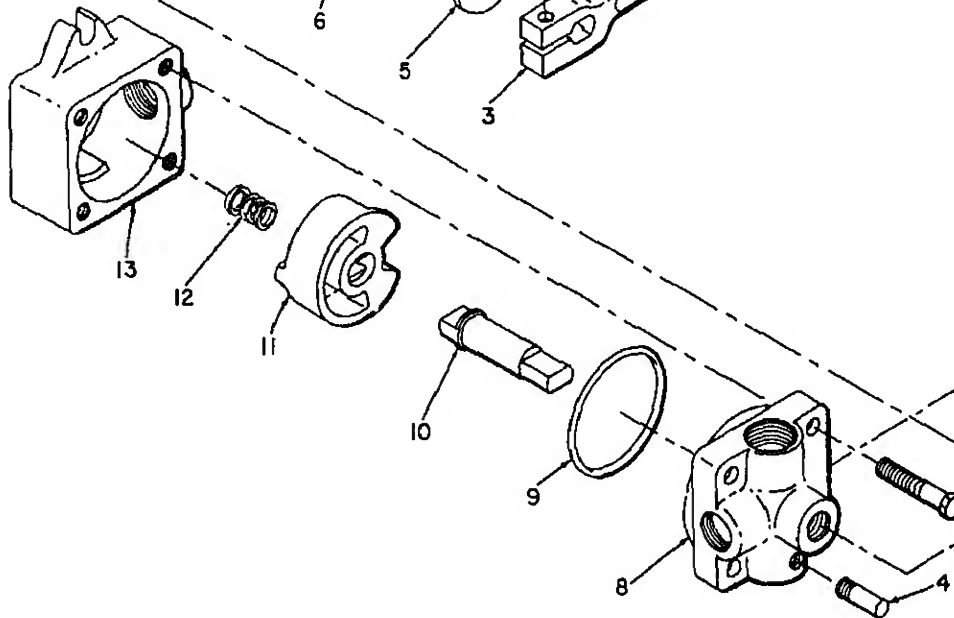
- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damaged thread. Retap or rechase threads if stripped or crossed or replace if unserviceable.
- c. Note that disc (11) and body (8) are matched parts and may not be replaced individually.
- d. Replace O-ring (9).

### 6-41. Reassembly

Reassemble propelling control valve in reverse of numerical sequence as illustrated on figure 6-16.

### 6-42. Installation

Install the propelling control valves as described in paragraph 3-62.



MEC 382

- 1 Lubrication fitting, 1/8 in.
- 2 Screw, cap, hex-hd, 5/16-18 x 7/8 in.
- 3 Lever
- 4 Spring stop pin
- 5 Washer, flat, 21/82 ID x 2 OD x 1/8 in. thk
- 6 Lever spring
- 7 Screw, cap, hex-hd, 1/2-18 x 1 1/2 in. (4)

- 8 Body
- 9 O-ring
- 10 Spindle
- 11 Disc
- 12 Disc spring
- 13 Cap

*Figure 6-16. Propelling control valve, exploded view.*

## Section VII. RETURN LINE OIL FILTER AND THROTTLE VALVE

### 6-43. General

This section contains repair instructions for the return line oil filter and throttle valve. The return line oil filter filters the hydraulic fluid before it returns to the hydraulic reservoir (fig. 1-5). The throttle valve is the on-off control for the hydraulic pump assembly, which furnishes the hydraulic power to position the booms and drill guide (fig. 1-5).

### 6-44. Removal

b. *Throttle Valve.* To remove the throttle valve, disconnect fittings (fig. 1-5) and remove the throttle valve from the pump assembly mounting bracket.

### 6-45. Disassembly

a. *Return Line Oil Filter.* To remove the return line oil filter, disconnect the filter from the pump assembly as illustrated on figure 6-17. Remove the filter element (5, fig. 6-17) and gasket

clean all parts with an approved solvent, and dry with compressed air.

## 7. Inspection and Repair

Inspect all parts for wear and damage. Inspect all hardware for damaged threads. Retap or rechase threads if stripped, crossed, or replace if unserviceable.

## 8. Reassembly

**Return Line Oil Filter.** Reassemble return oil filter in reverse of numerical sequence illustrated on figure 6-17. Tighten body

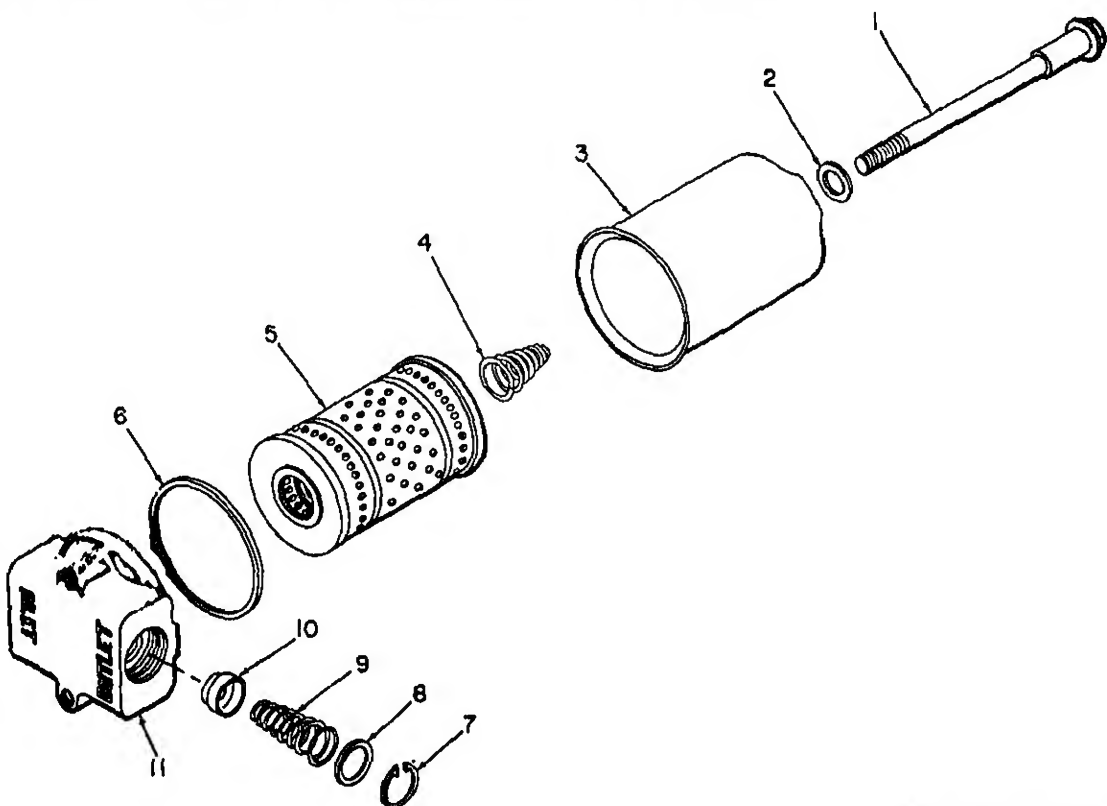
100-100 pound.

**b. Throttle Valve.** Reassemble throttle valve in reverse of numerical sequence as illustrated on figure 6-18.

## 6-49. Installation

**a. Return Line Oil Filter.** See figure 1-5. Connect the return line oil filter in the line to the hydraulic reservoir in the boom base assembly.

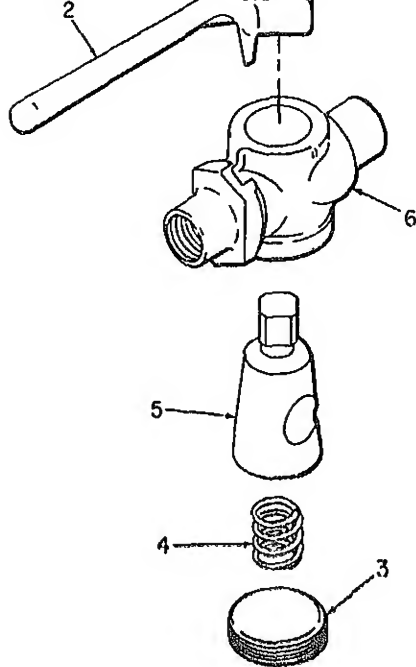
**b. Throttle Valve.** Mount the throttle valve on the nipple of the hydraulic valve mounting bracket. See figure 1-5 and connect the throttle valve fittings.



Body bolt, hex-hd  
Washer, flat  
Filter body  
Spring

7 Retaining ring  
8 Washer, flat  
9 Spring  
10 Poppet

MEC 3820-239-15/6



MEC 3820-

1 Spring pin, 5/32 dia x 1 3/16 in.  
2 Handle

3 Plug  
4 Spring

5 Stem  
6 Valve body

Figure 6-18. Throttle valve, exploded view.

## Section VIII. POWER DUMP AND SWING ASSEMBLY

### 6-50. General

This section contains repair instructions for the power dump and swing assembly. This assembly consists essentially of a dump cylinder and a swing cylinder, which hydraulically position the drill guide at the desired drilling angle in response to commands from the hydraulic valve assembly (fig. 1-5).

### 6-51. Removal

Remove the power dump and swing assembly as described in paragraph 5-14a.

### 6-52. Disassembly

in the numerical sequence as figure 6-19.

b. *Dump Cylinder.* Disassemble the dump cylinder in the numerical sequence shown on figure 6-20. Note the following procedures:

(1) Using a suitable spanner, remove the screw retainer ring (8) and slide piston rod and all parts attached to the assembly (23).

(2) Remove lock nut (9), and slide all parts off piston rod.

6-21. Note the following special res:

Pry snap ring (20, fig. 6-21) out of the groove in cylinder head (13).

Using a suitable spanner wrench, unscrew cylinder head (13), and slide piston rod assembly (21) with all parts attached, out of barrel assembly (22).

*Note.* The cylinder head cannot be removed when unscrewed, since it will not fit over the fitting of the piston rod.

Remove lock nut (8), and take all parts off piston rod assembly (21) from the nut end of the rod.

After sliding cylinder head (13) off piston rod assembly (21), remove the parts (15 through 19) from the cylinder head.

Discard all O-rings.

Clean all parts with an approved solvent and blow dry with compressed air.

## 6-54. Inspection and Repair

- Inspect all parts for wear and damage.
- Inspect all hardware for damage threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

## 6-55. Reassembly

a. *Swing Cylinder.* Reassemble swing cylinder in reverse of numerical sequence as illustrated on figure 6-21.

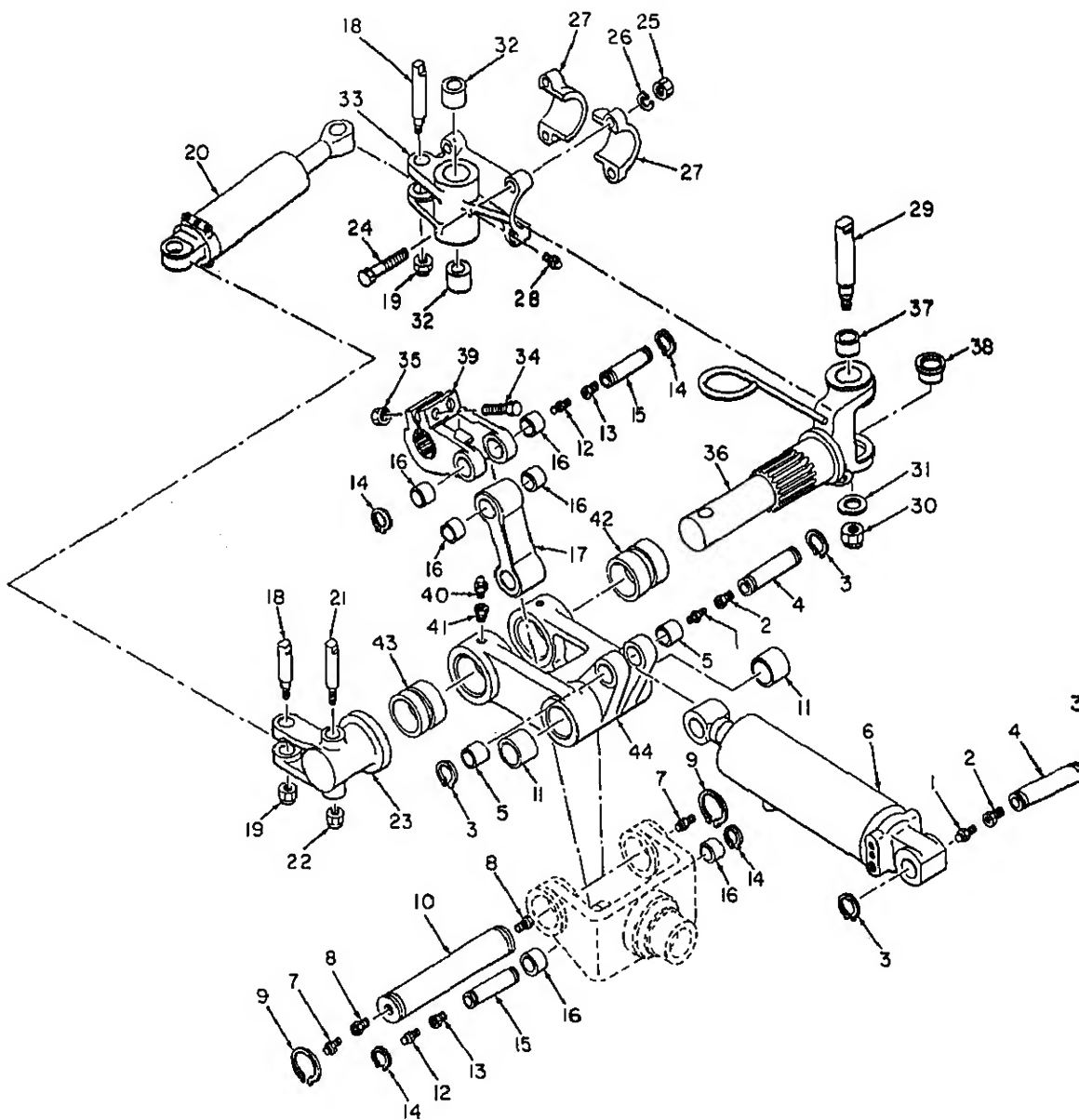
b. *Dump Cylinder.* Reassemble dump cylinder in reverse of numerical sequence as illustrated on figure 6-20.

a. *Power Dump and Swing Assembly.* Reassemble power dump and swing assembly in reverse of numerical sequence as illustrated on figure 6-19.

## 6-56. Installation

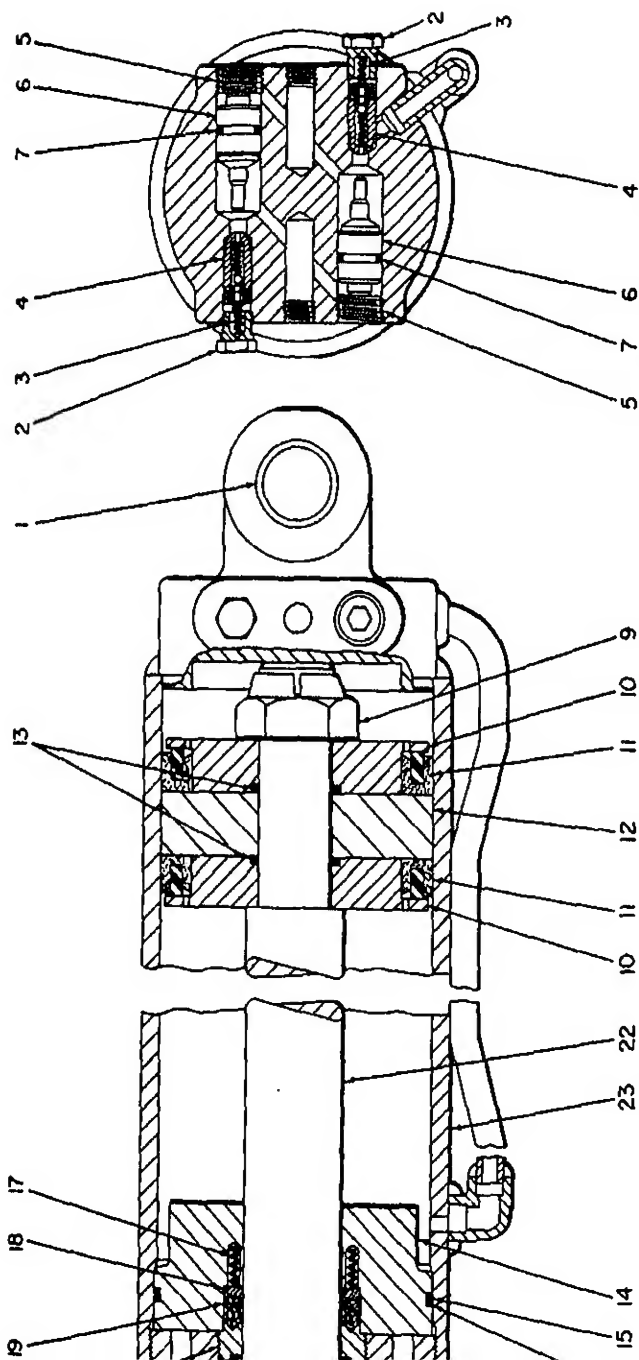
Install power dump and swing assembly as described in paragraph 5-14b.





5	Dump pin (2)	26	Washer, lock, 7/8 in. (2)
6	Dump link bushing (2)	27	Guide mounting swivel cap (2)
6	Dump cylinder	28	Lubrication fitting
7	Lubrication fitting (2)	29	Guide mounting swivel bolt, 1 1/2-in.
8	Reducing bushing (2)	30	Nut, self-locking hex, 1 1/2-12
9	Retaining ring (2)	31	Washer, flat, 1 1/2 in.
10	Dump pivot pin	32	Guide mounting swivel bushing (2)
11	Front boom bushing (2)	33	Guide mounting swivel
12	Lubrication fitting (2)	34	Pinch bolt, sq-hd, 3/4-10 x 3 in. (2)
13	Reducing bushing (2)	35	Nut, hex, 3/4-10 (2)
14	Retaining ring (4)	36	Dump shaft assembly
15	Dump pin (2)	37	Dump shaft hinge bushing
16	Dump link bushing (6)	38	Dump shaft hinge bushing
17	Dump link	39	Dump clevis
18	Swing and dump cylinder bolt, 7/8-14 x 5 11/16 in. (2)	40	Lubrication fitting
19	Nut, self-locking hex, 7/8-14 (2)	41	Reducing bushing
20	Swing cylinder	42	Dump shaft hinge bushing
21	Swing clevis bolt, 7/8-14 x 7 1/8 in.	43	Dump shaft bushing
22	Nut, self-locking hex, 7/8-14	44	Dump arm

*Figure 6-19—Continued.*

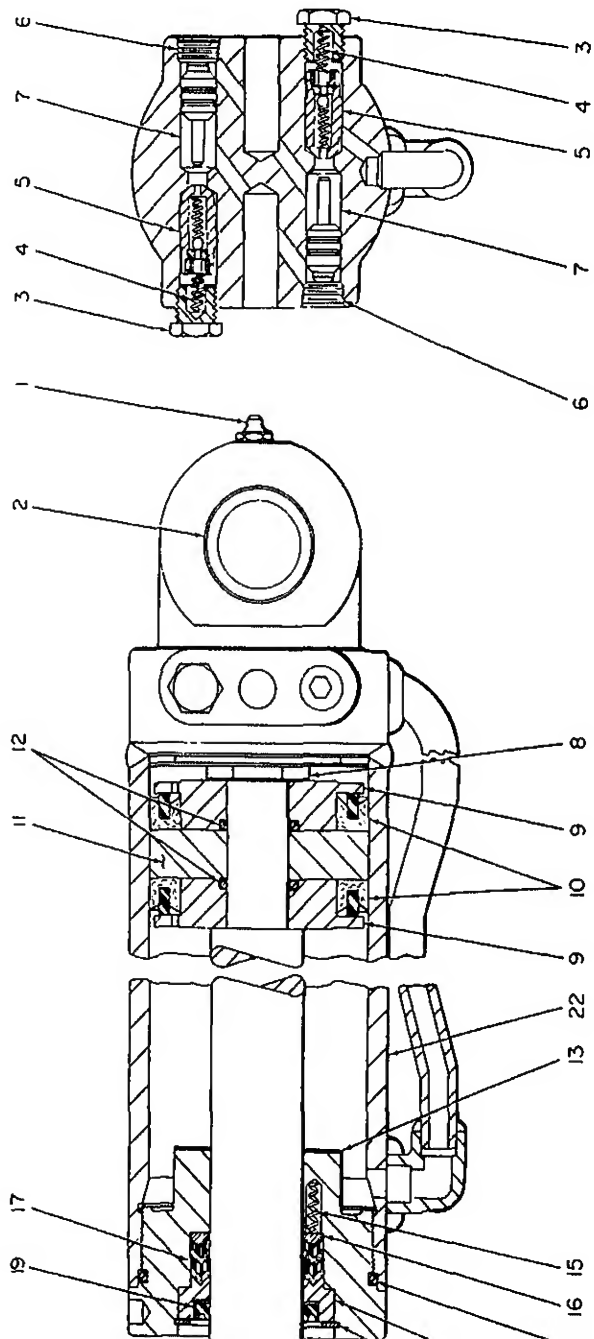


18 Male adapter  
 19 V-packing (4)  
 20 Gland nut  
 21 Rod wiper  
 22 Piston rod assembly  
 23 Barred assembly

10 Backing plate (2)  
 11 U-cup (2)  
 12 Piston  
 13 O-ring (2)  
 14 Cylinder head  
 15 O-ring  
 16 Backup ring

bushing  
 hex-hd, 3/8 in. (2)  
 relief poppet (2)  
 socket-hd, 3/4 in. (2)  
 piston (2)  
 g (2)  
 ring

Figure 6-20—Continued.



17 V-packing (4)  
 18 Gland nut  
 19 Rod wiper  
 20 Snap ring  
 21 Piston rod assembly  
 22 Barrel assembly

9 Backing plate (2)  
 10 U-cup (2)  
 11 Piston  
 12 O-ring (2)  
 13 Cylinder head  
 14 O-ring  
 15 Spring (3)  
 16 Male adapter

on fitting (2)  
 nder bushing (2)  
 , hex-hd, 3/8 in. (2)  
 )  
 relief poppet (2)  
 , socket-hd, 3/8 in. (2)  
 k piston (2)  
 hex, 1-14

Figure 6-21—Continued.

This section contains repair instructions for the power guide extension mounting. This assembly contains a hydraulic cylinder which moves the drill guide up and down in response to commands from the hydraulic valve assembly (fig. 1-5).

### **6-58. Removal**

Remove the power guide extension mounting as described in paragraph 5-13a.

### **6-59. Disassembly**

*a. Power Guide Extension Mounting.* Disassemble the power guide extension mounting in the numerical sequence as illustrated on figure 6-22.

*b. Drill Guide Extension Cylinder.* Disassemble drill guide extension cylinder in the numerical sequence as illustrated on figure 6-23. Note the following special procedures:

- (1) Pry snap ring (24, fig. 6-23) out of the groove in cylinder head (30).
- (2) Using a suitable spanner wrench, unscrew cylinder head (30), and slide piston rod assembly (23) with all parts attached, out of barrel assembly (32).
- (3) Straighten or cut lock pin (16), and take all parts off piston rod assembly (23) from the pin end of the rod.
- (4) After sliding cylinder head (30) off piston rod assembly (23), remove the

index head.  
(5) Discard all O-rings.

### **6-60. Cleaning**

Clean all parts with an appropriate solvent and blow dry with compressed air.

### **6-61. Inspection and Repair**

- a.* Inspect all parts for wear and damage.
- b.* Inspect all hardware for stripped threads. Retap or rechase threads if damaged, cross-threaded, or crossed, or replace if unserviceable.

### **6-62. Reassembly**

*a. Drill Guide Extension Cylinder.* Assemble drill guide extension cylinder in the reverse of numerical sequence as illustrated on figure 6-23. After all parts are assembled, install lock pin (16) so that equal lengths of the pin extend from both sides of the rod, and flare the ends of the pin to retain it in position.

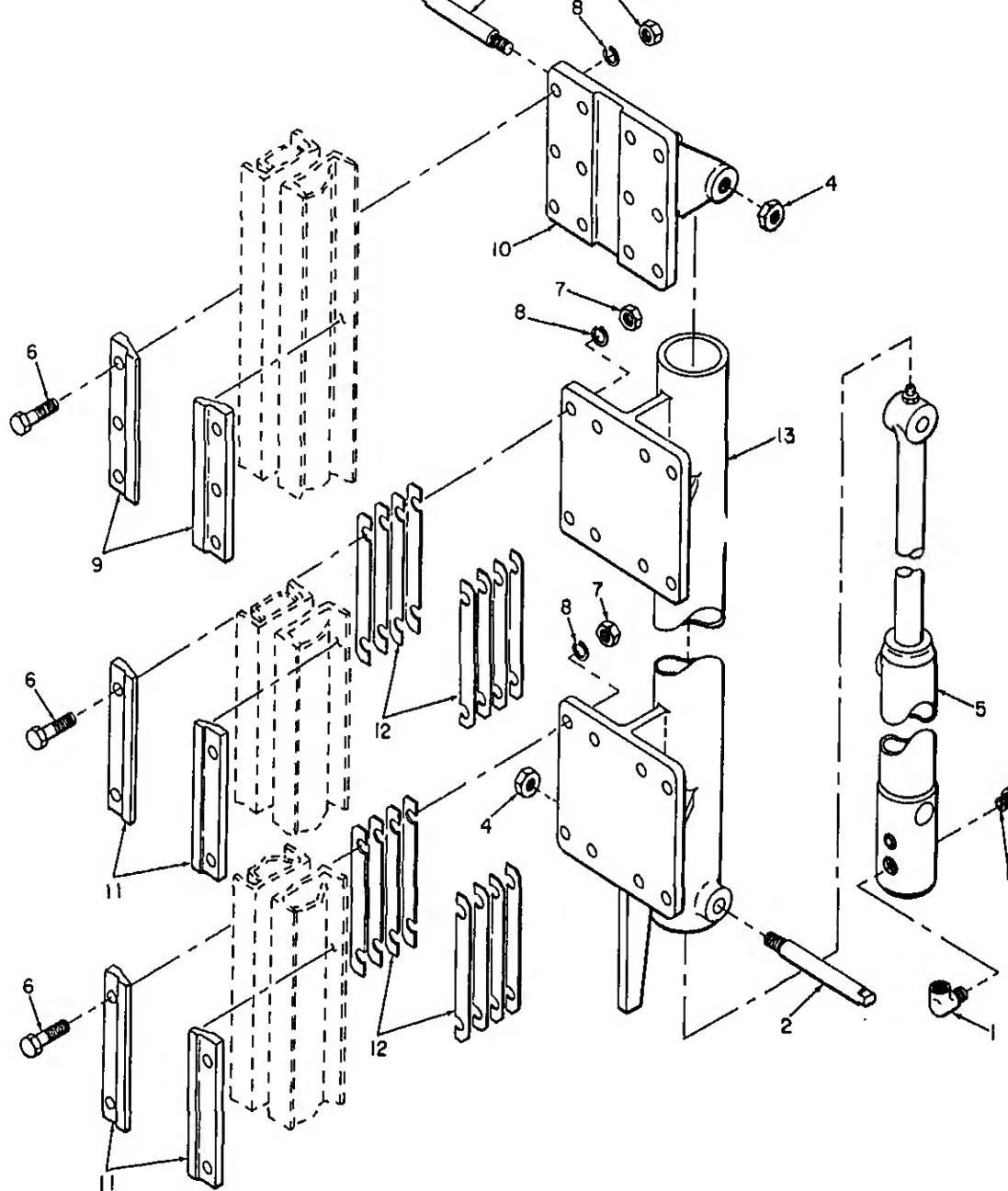
*b. Power Guide Extension Mounting.* Assemble power guide extension mounting in the reverse of numerical sequence as illustrated on figure 6-22. Do not install clamp until ready to install the assembly on the drill guide.

### **6-63. Installation**

Install the power guide extension mounting as described in paragraph 5-13b.





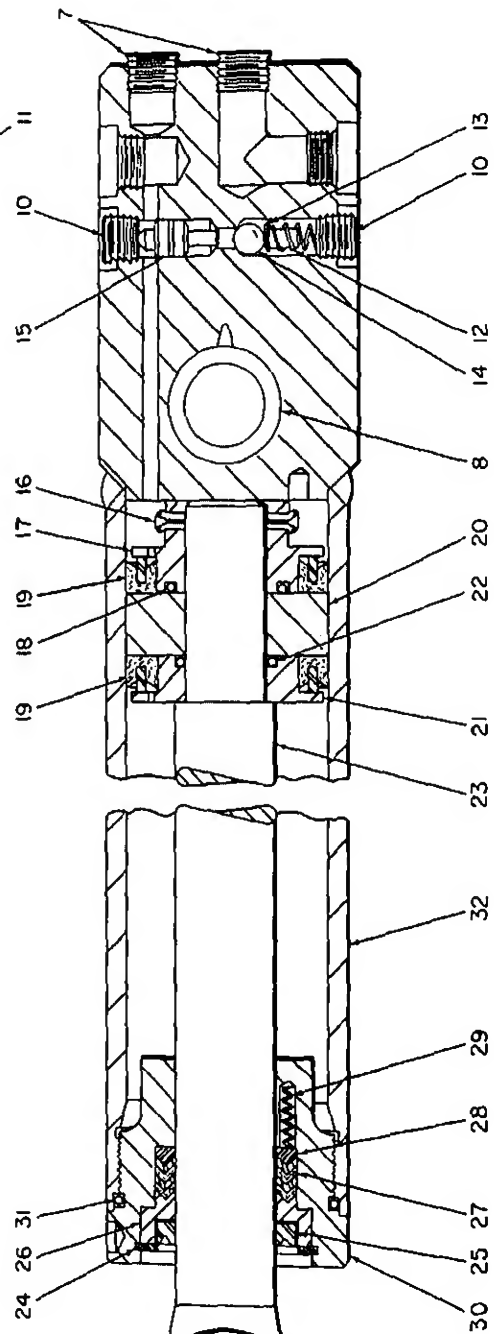
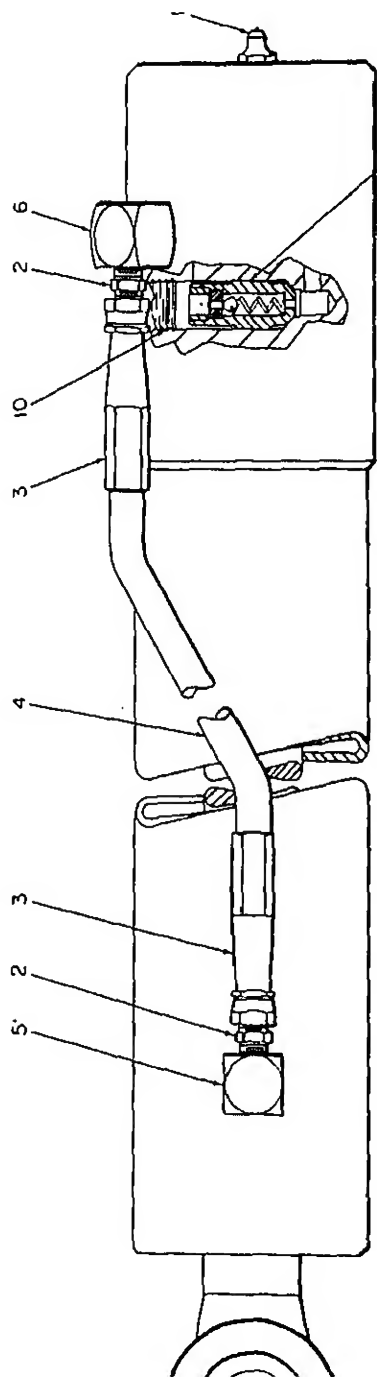


ex-hd, 5/8-11 x 2 1/4 in. (14)  
x, 5/8-11 (14)

12 Clamp shims (16)  
13 Drill guide mounting plate

*Figure 6-22—Continued.*

---



- 1 Lubrication fitting (2)
- 2 Adapter (2)
- 3 Swivel fitting (2)
- 4 Hose
- 5 Elbow
- 6 Elbow
- 7 Pipe plug, 3/8 in. (2)
- 8 Extension cylinder bushing
- 9 Extension cylinder rod bushing
- 10 Pipe plug (3)
- 11 Thermal relief poppet

- 12 Stop pin
- 13 Steel ball
- 14 Pilot piston
- 15 Lock pin
- 16 Backing plate
- 17 O-ring
- 18 U-cup (2)
- 19 Piston
- 20 Backing plate
- 21 O-ring

- 24 Snap ring
- 25 Rod wiper
- 26 Gland nut
- 27 V-packing
- 28 Male adapter
- 29 Spring (3)
- 30 Cylinder head
- 31 O-ring
- 32 Barrel assembly

*Figure 6-23—Continued.*

the hydraulic boom assembly. The assembly consists essentially of a boom swing cylinder and a boom lift cylinder, which hydraulically position the boom in response to commands from the hydraulic valve assembly (fig. 1-5).

## 6-65. Removal

Remove the hydraulic boom assembly as described in paragraph 5-15a.

## 6-66. Disassembly

a. *Hydraulic Boom Assembly.* Disassemble the hydraulic boom assembly in the numerical sequence as illustrated on figure 6-24.

b. *Boom Swing Cylinder.* Disassemble boom swing cylinder in the numerical sequence as illustrated on figure 6-25. Note the following special procedures:

- (1) Cut the lockwire and remove screws (10, fig. 6-25), gland nut (12), and rod wiper (11).

*Note.* The gland nut and rod wiper cannot be taken off completely since they will not fit over the rod fittings.

- (2) Unscrew cylinder head (13) and slide piston rod assembly (26) with all parts attached, out of barrel assembly (27).
- (3) Remove lock nut (19), and take all parts off piston rod assembly (26) from the nut end of the rod.
- (4) Discard all O-rings.

c. *Boom Lift Cylinder.* Disassemble boom lift cylinder in the numerical sequence as illustrated on figure 6-26. Note the following special procedures.

- (1) Cut the lockwire and remove screws (11, fig. 6-26), gland nut (18), and rod wiper (12).

(2) Unscrew cylinder head (14) and slide piston rod assembly (27) with all parts attached, out of barrel assembly (28).

- (3) Remove lock nut (20), and take all parts off piston rod assembly (27) from the nut end of the rod.

- (4) Discard all O-rings.

## 6-67. Cleaning

Clean all parts with an approved solvent and blow dry with compressed air.

## 6-68. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

## 6-68. Reassembly

a. *Boom Lift Cylinder.* Reassemble boom lift cylinder in reverse of numerical sequence as illustrated on figure 6-26.

b. *Boom Swing Cylinder.* Reassemble boom swing cylinder in reverse of numerical sequence as illustrated on figure 6-25.

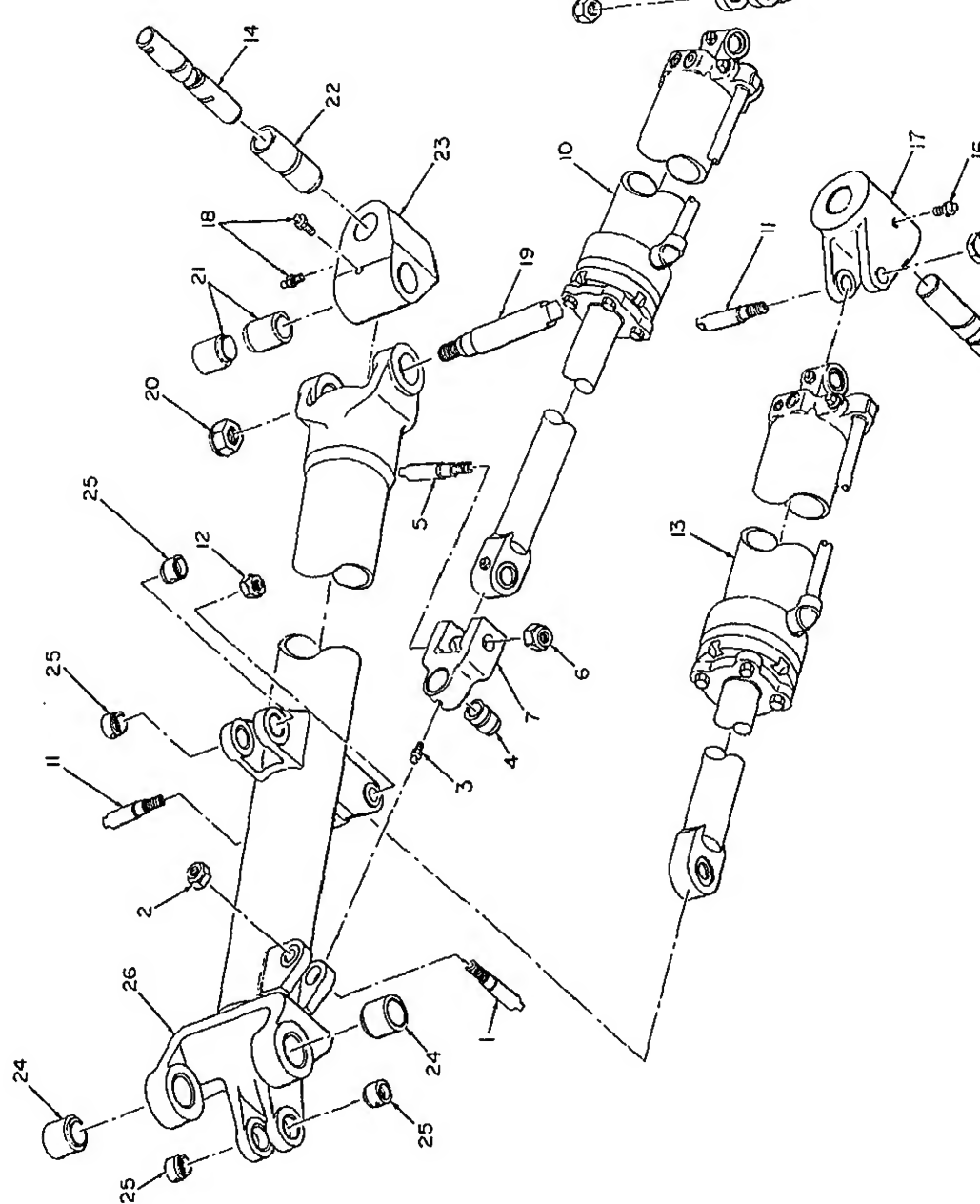
*Note.* Install lockwire through screws (11, fig. 6-26 and 10, fig. 6-25) to keep them tight.

c. *Hydraulic Boom Assembly.* Reassemble hydraulic boom assembly in reverse of numerical sequence as illustrated on figure 6-24.

## 6-70. Installation

Install the hydraulic boom assembly described in paragraph 5-15b.





19 Boom pedestal pin  
 20 Nut, self-locking hex, 1 1/2-12  
 21 Boom pedestal bushing (2)  
 22 Boom pedestal king pin bushing  
 23 Boom pedestal  
 24 Front boom bushing (2)  
 25 Dump link bushing (4)  
 26 Bare boom

10 Boom swing cylinder  
 11 Clevis bolt, 1-12 x 5 1/4 in. (2)  
 12 Nut, self-locking hex, 1-12 (2)  
 13 Boom lift cylinder  
 14 Cylinder pedestal king pin (2)  
 15 Boom swing cylinder pedestal pin  
 16 Lubrication fitting (2)  
 17 Cylinder pedestal (2)  
 18 Lubrication fitting (2)

*Figure 6-24—Continued.*

s bolt, 1-12 x 5 1/4 in.  
 self-locking hex, 1-12  
 lubrication fitting  
 a cylinder bushing  
 s bolt, 1-12 x 5 1/4 in.  
 self-locking hex, 1-12  
 g cylinder clevis  
 is bolt, 1-12 x 5 1/4 in.  
 self-locking hex, 1-12



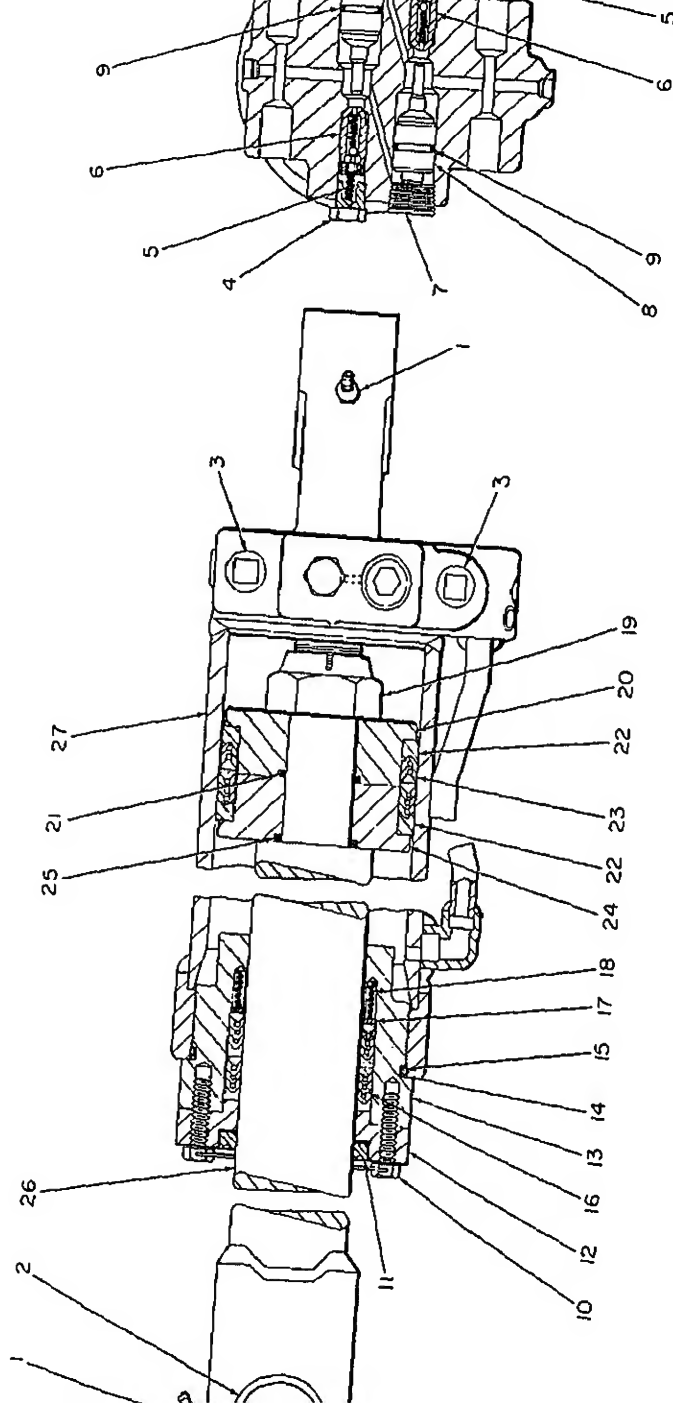


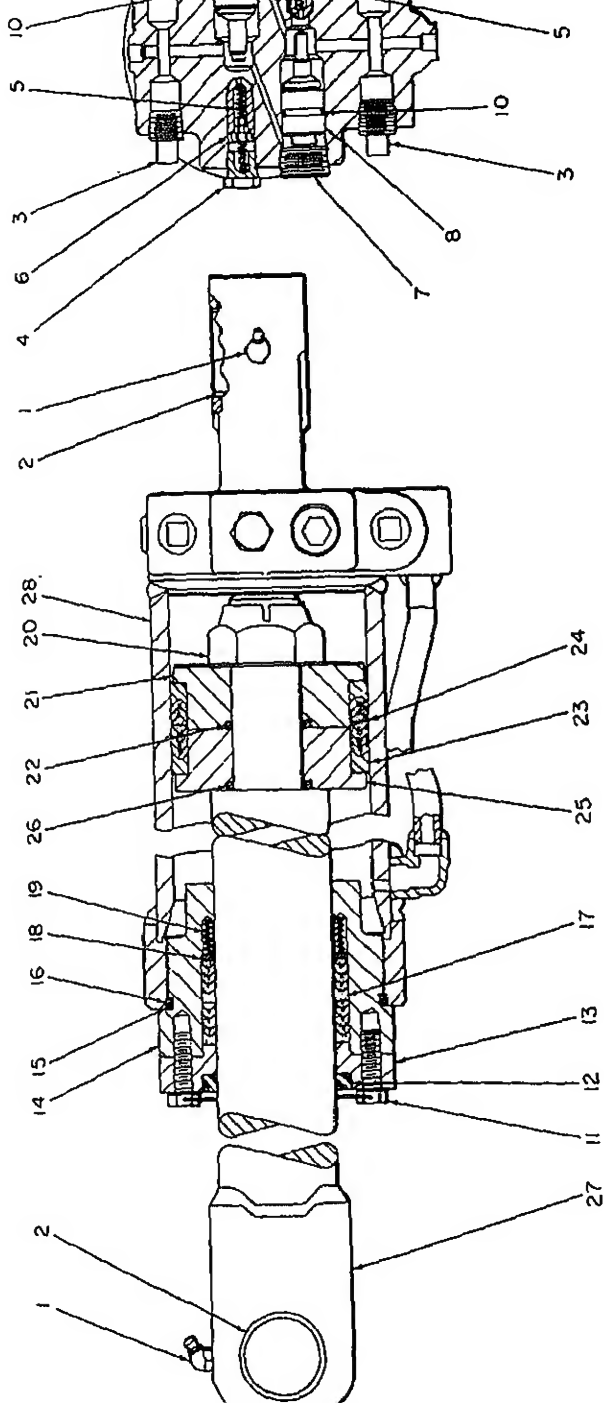
Figure 6-25. Boom swing cylinder.

20 Rear backing plate  
21 O-ring  
22 Female adapter (2)  
23 Piston packing  
24 Front backing plate  
25 O-ring  
26 Piston rod assembly  
27 Barrel assembly

10 Cap screw (4)  
11 Rod wiper  
12 Gland nut  
13 Cylinder head  
14 Backup ring  
15 O-ring  
16 Rod packing (2 sets)  
17 Packing washer  
18 Spring (6)

ation fitting (2)  
-cylinder bushing (2)  
lug, sq-hd, 1/2 in. (2)  
lug, hex-hd, 3/8 in. (2)  
(2)  
al relief poppet (2)  
lug, socket-hd, 3/4 in. (2)  
heck piston (2)  
ring (2)

Figure 6-25—Continued.



11 Cap screw (2)  
 12 Rod wiper  
 13 Gland nut  
 14 Cylinder head  
 15 Backup ring  
 16 O-ring  
 17 Rod packing (2 sets)  
 18 Packing washer  
 19 Spring (6)  
 20 Nut, lock, hex, 1 1/2-12

22 O-ring  
 23 Female adapter (2 rqr)  
 24 Piston packing  
 25 Front backing plate  
 26 O-ring  
 27 Piston rod assembly  
 28 Barrel assembly

Figure 6-26—Continued.

the boom base assembly. This assembly contains an integral hydraulic reservoir, and serves as the mounting pad for the hydraulic boom assembly, hydraulic pump assembly, and manifold lubricator.

### **6-72. Removal**

Remove the boom base assembly as described in paragraph 5-16a.

### **6-73. Disassembly**

Disassemble boom base assembly in the numerical sequence as illustrated on figure 6-27.

### **6-74. Cleaning**

- a. Clean all parts with an approved solvent, and blow dry with compressed air.
- b. Flush the hydraulic reservoir to insure freedom from contamination.

b. Inspect all hardware for damage to threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

### **6-76. Reassembly**

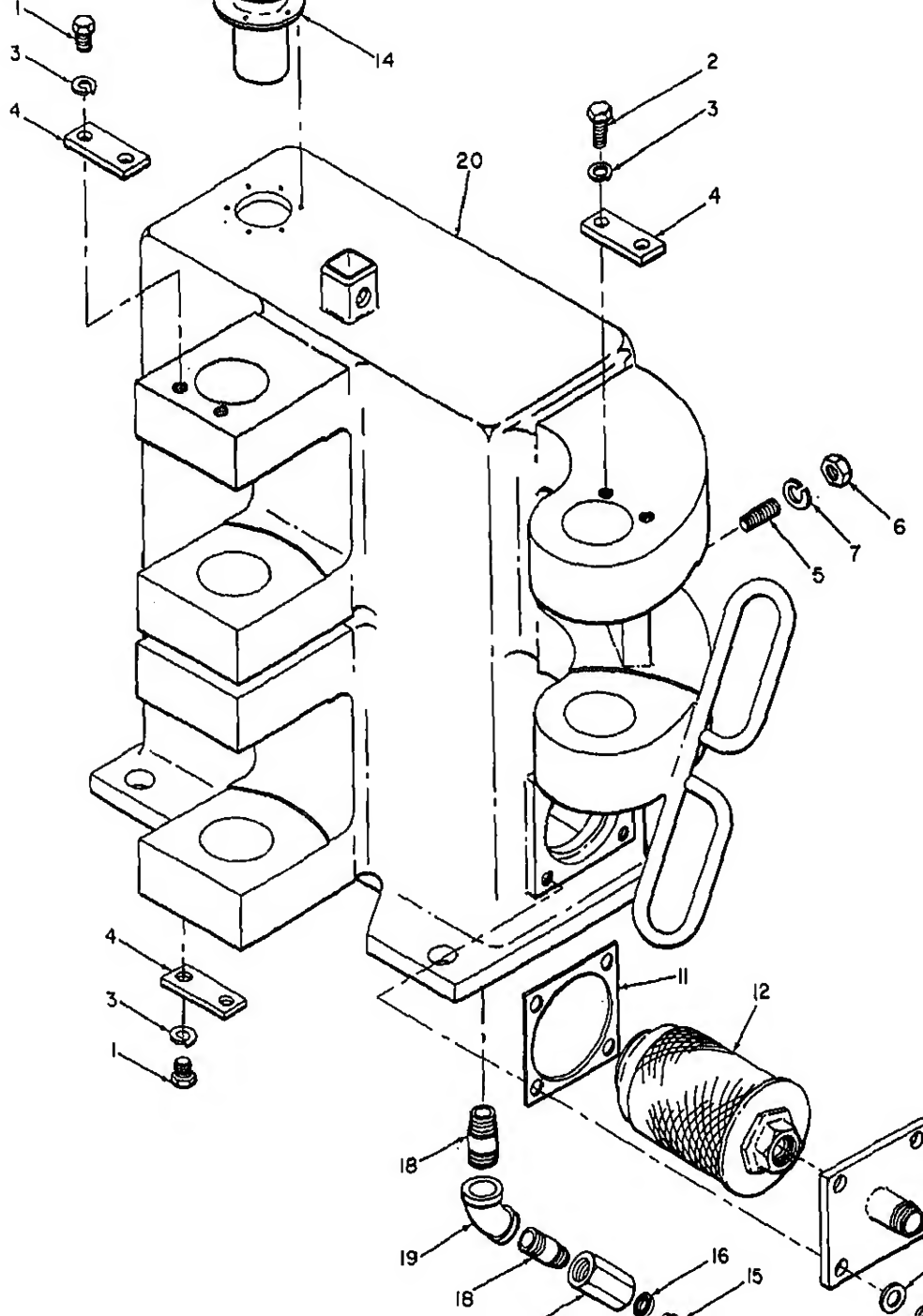
Reassemble boom base assembly in reverse of numerical sequence as illustrated on figure 6-27.

**Caution:** Cleanliness of the hydraulic reservoir is of the utmost importance. Any contamination entering this closed system will cause erratic boom operation and accelerated wear on parts.

### **6-77. Installation**

Install the boom base assembly as described in paragraph 5-16b.





8 Screw, cap, flat 3/8 in. (4)  
9 Washer, flat 3/8 in. (4)  
10 Oil filter cap  
11 Oil filter cap gasket  
12 Suction oil filter  
13 Drive screw (6)  
14 Vent cap

16 Gasket  
17 Hydraulic drain adapter  
18 Short nipple, 1 x 2 in. (2)  
19 Elbow, 1 in.  
20 Boom base

Figure 6-27—Continued.



This section contains repair instructions for the complete traction drive. The pneumatic drill contains two complete traction drives (one for each traction unit), which are identical except for orientation, and quantities specified throughout this section are for one traction drive.

## 6-79. Removal

Remove the complete traction drive as described in paragraph 5-17a.

## 6-80. Disassembly

*a. Complete Traction Drive.* Disassemble complete traction drive in the numerical sequence as illustrated on figure 6-28. Note the following special procedures:

- (1) After draining the hydraulic oil by removing magnetic plug (1, fig. 6-28) and pipe plugs in bottom of gear housing (53) and propelling air motor (10), remove screws (7), nuts (8), and lock washers (9), and carefully pull the propelling air motor off the shaft of motor pinion gear (12).
- (2) Remove casing cover (14). Remove and discard both motor case gaskets (13).
- (3) Remove motor pinion gear spacer (11), and pull out motor pinion gear (12). If motor pinion ball bearing (41) comes out with the gear, remove the bearing using a suitable bearing puller to bear on the inner race only.
- (4) Using retaining ring pliers, remove retaining rings (15), and pull the assembled planet gears (18), ball bearings (17), and retaining rings (16) off the stubs of drive shaft (42).

*Note.* The ball bearings are press-fitted into the planet gears, and should not be removed unless replacement is required.

- (5) Remove washers (24), and lock washers (25), with screwdriver, and jam nut (21) attached to drive shaft (42).
- (7) Insert two 5/8-11 thread screws (27) into the holes in the top of the housing (27), and pull out the O-ring (28).
- (8) Loosen jam nut (30) on drive shaft setscrew (29) and turn sure on the trunnion assembly (39).
- (9) Remove brake band (31).
- (10) Remove bolt (32), washer (33), and brake band (31).
- (11) Remove brake cylinder (34) and brake cylinder case (35).
- (12) Remove brake band (31) from the housing.
- (13) Using retaining ring pliers, remove retaining ring (40) from drive shaft (42), with O-ring (41) and pinion ball bearing (41) out of gear housing. If pinion ball bearing is installed in the housing, pull it out of the recess in the housing with an internal bearing puller.
- (14) If necessary for repair, remove retaining ring (43) from drive shaft ball bearing (44) and bore in gear housing. Use bearing puller to pull bearing pusher to the inner race of the bearing.
- (15) Drive out roll pin (45) and clutch lock pin handle (46).
- (16) Drive out roll pin (47) and clutch spring cap (48) and retaining parts.

*b. Propelling Air Motor.* Disassemble propelling air motor in the numerical sequence as illustrated on figure 6-29. Note the following special procedures:

- (1) Remove one cylinder (49) and cylinder gasket (50).
- (2) Rotate crank assembly (51) to the top of the stroke.

- the fingers.
- (3) Remove piston ring (16) and oil regulating ring (17) from piston (18).
  - (4) Repeat the above procedure until all pistons are removed.
  - (5) Pull the entire crank (26 through 39) out of motor case (43). If necessary, tap the face of the motor case with a mallet to free ball bearing (39) from its bore.

*Note.* If the crank parts cannot be removed, first remove rotary valve (24) as described in steps 10 and 11. Then insert a hardwood arbor through rotary valve bushing (41), and drive out the crank.

- (6) Remove cotter pin (27) and castellated nut (28). Drive out crank lock pin (29).
- (7) Separate valve end crank (30) from pin end crank (37).

*Note.* These parts are matched and must not be replaced individually.

- (8) Remove connecting rod rings (33), connecting rods (34), connecting rod bushing (32), and crank pin sleeve (31).
- (9) If necessary to remove ball bearings (26 and 39), use a suitable bearing puller to remove them from the crank.
- (10) Remove valve chest cover (21).
- (11) Screw a 1 1/8-inch threaded bolt into the tapped hole in the exposed rotary valve (24). Pull the bolt to remove the rotary valve.

*Note.* Do not remove valve chest (40) unless necessary to replace rotary valve bushing (41).

- (12) To remove valve chest (40), screw two 5/8-11 threaded bolts (at least 4 inches long) into the tapped holes

out of the valve chest using a suitable arbor.

**Caution:** Be careful not to shear off bushing key (42). Make sure that the arbor clears the key during removal.

## 6-81. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

## 6-82. Inspection and Repair

a. Inspect all parts for wear and damage. Refer to table 4-1 for permissible wear measurements.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

c. Inspect casing cover (14, fig. 6-28), brake piston (27), brake cylinder (37), drive shaft (42), and gear housing (53) for cracks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove nicks and burrs with a fine file or handstone, and retap or rechase all damaged threads. Replace if unserviceable.

d. Inspect all bearings for cracks, looseness, and wear. Replace if unserviceable.

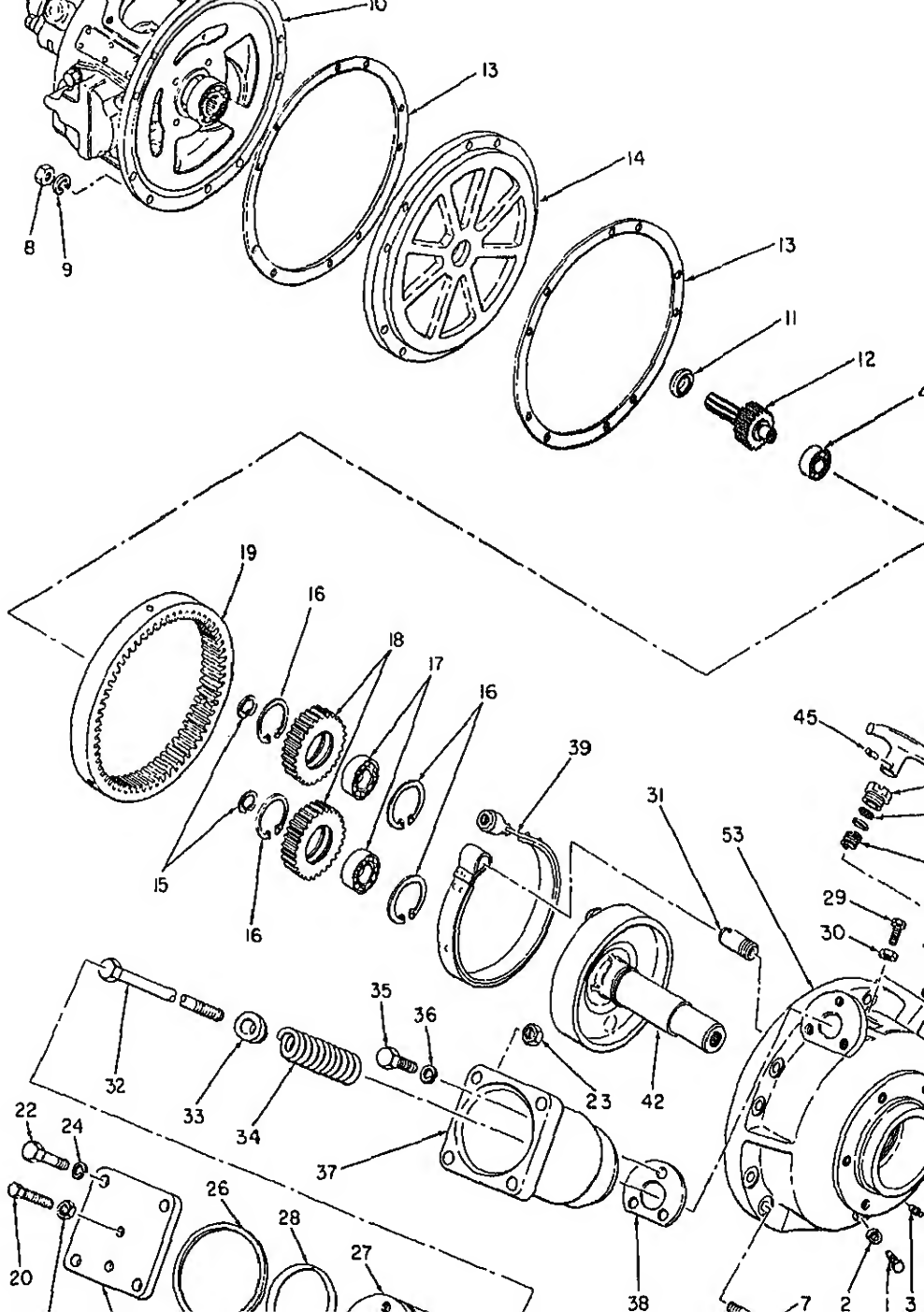
e. Inspect motor pinion gear spacer (11) for scoring marks and wear. Replace if damaged.

f. Inspect all gears and pinions for cracks, chipped teeth, damaged bores, and excessive wear. Replace if in doubt as to the serviceability of a part.

g. Inspect brake band assembly (39) for wear and damage. Replace if unserviceable.

## 6-83. Reassembly

a. *Propelling Air Motor.* Reassemble propelling air motor in reverse of numerical sequence as illustrated on figure 6-29. Note the following special procedures:



Magnetic plug, 3/4-16  
 Gasket  
 Pipe plug, sq-hd, 1/2 in.  
 Nut, hex, 5/8-11 (6)  
 Washer, lock, 5/8 in. (6)  
 Stud, 5/8-11 x 3 in. (6)  
 Screw, cap, hex-hd, 1/2-13 x 2 1/2 in. (9)  
 Nut, hex, 1/2-13 (9)  
 Washer, lock, 1/2 in. (9)  
 Propelling air motor  
 Motor pinion gear spacer  
 Motor pinion gear  
 Motor case gasket (2)  
 Gasing cover  
 Retaining ring (2)  
 Retaining ring (4)  
 Ball bearing (2)  
 Planet gear (2)  
 Internal gear  
 Setscrew, hex-hd, 1/2-13 x 2 in.  
 Jam nut, hex, 1/2-13  
 Screw, cap, hex-hd, 5/8-11 x 2 in. (4)  
 Nut, hex, 5/8-11 (4)  
 Washer, lock, 5/8 in. (4)

O-ring  
 Brake shaft setscrew, 1/2-13 x 1 1/4 in.  
 Jam nut, hex, 1/2-13  
 Brake band anchor pin  
 Bolt, machine, hex-hd, 3/4-10 x 8 1/2 in.  
 Brake spring washer  
 Brake spring  
 Screw, cap, hex-hd, 1/2-13 x 1 1/4 in. (3)  
 Washer, lock, 1/2 in. (3)  
 Brake cylinder  
 Brake cylinder case gasket  
 Brake band assembly  
 Retaining ring  
 Motor pinion ball bearing  
 Drive shaft  
 Retaining ring  
 Drive shaft ball bearing  
 Roll pin  
 Clutch lock pin handle  
 Roll pin  
 Clutch spring cap  
 Clutch lock pin  
 Spring  
 Spring washer  
 O-ring  
 Gear housing

Figure 6-28—Continued.

*Note.* Pin end crank (37) and valve end crank (30) are matched parts and must not be intermixed. Make sure that both pieces have identical identification marks.

- (2) Install connecting rod bushing (32) over crank pin sleeve (31).
- (3) Install connecting rod rings (33) and connecting rods (34) so that the rods fit between the bushing and rings.
- (4) Join the valve end crank (30) with pin end crank (37), inserting the tang on crank pin sleeve (31) in the crank slot.
- (5) Aline lock pin holes in the crank sections, and drive crank lock pin (29) into position from the larger end of the tapered hole. Strike the larger end of the lock pin to make sure that it is seated properly, and install cap-

pusher to bear on the inner races of the bearings.

- (7) Only if the rotary valve bushing (41) was removed, install bushing (42) in valve chest (40). Aline slot in the rotary valve bushing with the key, and press in the bushing with the valve chest supported, until the bushing is flush with the outside of the valve chest cover (valve chest cover) supported face.

*Note.* If the rotary valve bushing is carefully installed, it will not be necessary to ream out the inside diameter.

- (8) Check the fit of rotary valve (24) in rotary valve bushing (41). If tighter than a good running fit, lap the valve to a proper fit, using a fine grinding compound with an abrasive that will not break up rapidly. If

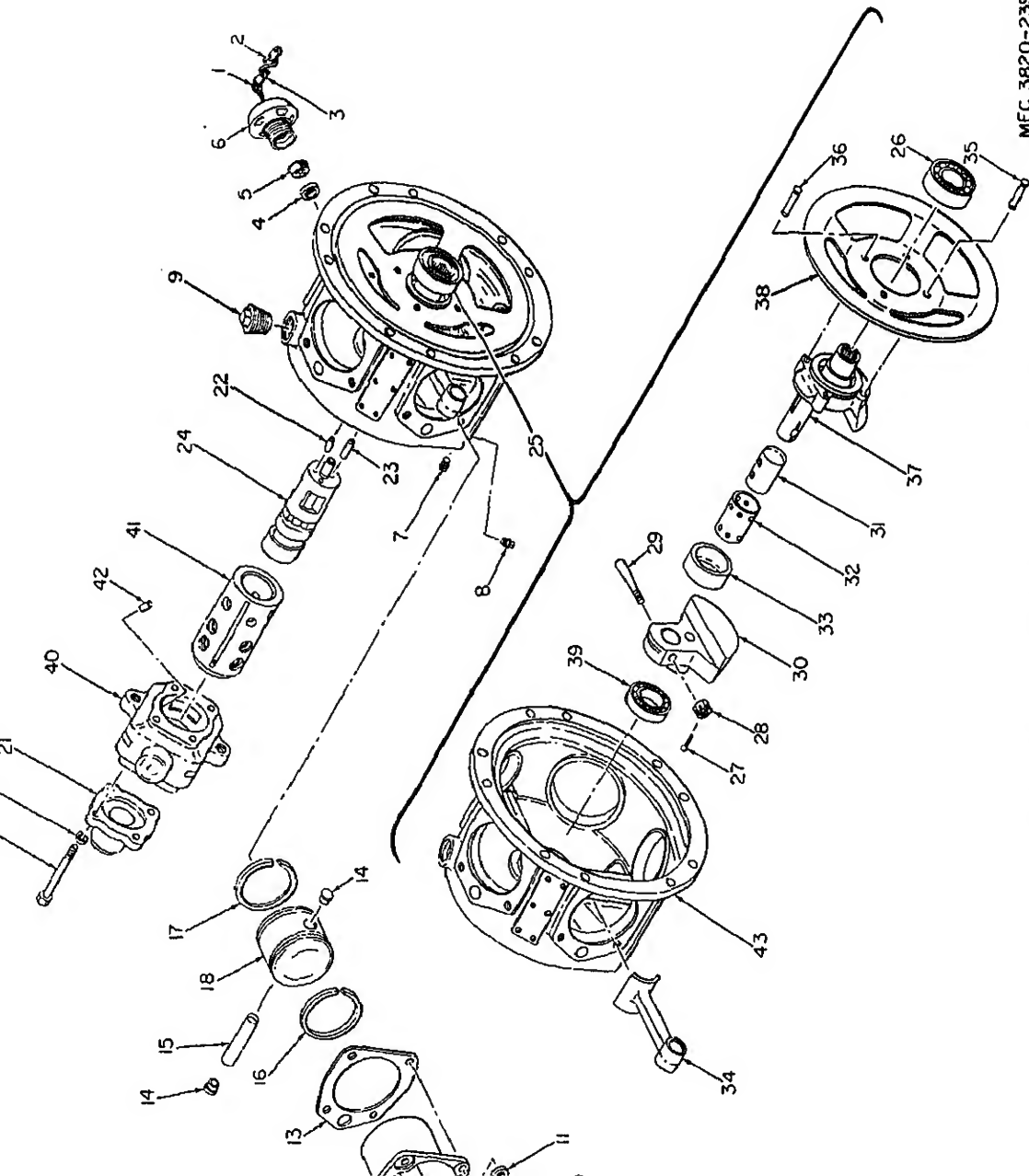


Figure 6-29. Propelling air motor, exploded view.

18	Piston (5)		
19	Valve chest screw, hex-hd, 3/8-16 x 4 in. (4)		
20	Washer, lock, 3/8 in. (4)		
21	Valve chest cover		
22	Dowel pin, 0.3125 dia x 1 in. (2)		
23	Dowel pin 0.376 dia x 1 1/4 in		
24	Rotary valve		
25	Crank assembly		
26	Ball bearing		
27	Cotter pin		
28	Nut, castellated, hex, 1/2-20		
29	Crank lock pin		
30	Valve end crank		
31	Chain		
32	Retainer		
33	Screen		
34	Gasket, 1/4 in. (2)		
35	Gasket, 3/4 in.		
36	Gasket, 1/4 in.		
37	Cap, hex-hd, 1/2-13 x 1 in. (20)		
38	Flat, 1/2 in. (20)		
39	Gasket (5)		
40	Cap (10)		
41	In (5)		
42	Connecting rod ring (2)		
43	Connecting rod (5)		
44	Oil splash rivet, 2 1/2 in. (2)		
45	Oil splash rivet, 3/4 in. (2)		
46	Pin end crank		
47	Oil splasher		
48	Ball bearing		
49	Valve chest		
50	Rotary valve bushing		
51	Bushing key		
52	Motor case		

Figure 6-29—Continued.

moved, and insert the rotary valve into rotary valve bushing (41).

- (10) Install valve chest cover (21).
- (11) Align bolt holes in valve chest (40) with those in motor case (43), and press the projecting end of rotary valve bushing (41) into the motor case.
- (12) Make sure that the bushing enters the motor case bore squarely (with the bolt holes aligned) and press the valve chest on until it contacts the motor case.

*Note.* Support the open end of the motor case during this operation.

- (13) Align the holes in the end of valve end crank (30) with the dowel pins of rotary valve (24), and install the assembled crank assembly into motor case (43). Make sure that ball bearing (39) is seated properly in the motor case.
- (14) Rotate the crank until one of the connecting rods is at top dead center. Place a piston (18) over this rod and secure with wrist pin (15) and wrist pin caps (14).
- (15) Using a suitable piston ring compressor to hold oil regulating ring (17) and piston ring (16) compressed, install cylinder (12) with cylinder gasket (13) over piston (18) and into the cylinder wall in motor case (43). Secure with screws (10) and washers (11).
- (16) Repeat steps 14 and 15 until all pistons and cylinders are installed.
- (17) Install all plugs and caps.

*b. Complete Traction Drive.* Reassemble complete traction drive in reverse of numerical sequence as illustrated on figure 6-28. Note the following special procedures:

*Note.* Coat gears, bushings, bearings, etc. with

ing in place.

- (2) Press motor pinion ball bearing (4) into the recess in drive shaft (42). Insert the drive shaft into gear housing (53), tapping with a mallet to seat the drive shaft shoulder against drive shaft ball bearing (44). Using retaining ring pliers, install retaining ring (40) in the shaft groove.
- (3) Lay brake band assembly (39) around drive shaft (42) so that the trunnion can be inserted in the hole leading to brake cylinder (87). Insert brake band anchor pin (31) through the loop in the brake band assembly and screw it into the tapped hole in gear housing (53), until the end of the pin is slightly below the upper shoulder of the brake band assembly.
- (4) Insert brake shaft setscrew (29). Back off setscrew 1/2 turn and tighten jam nut (30).
- (5) Install brake cylinder (37) with brake cylinder case gasket (38).
- (6) Mount brake spring washer (33) and brake spring (34) on bolt (32), and install the bolt to the required distance for proper brake adjustment (para 8-38).
- (7) Install O-ring (28) on brake piston (27) and install in the brake cylinder (37). Install brake cylinder cover (25) and brake cylinder gasket (26). Install setscrew (20) and jam nut (21). Turn the setscrew in until it contacts the piston. Back off 1/8 turn and secure the jam nut. Apply 60 psi air pressure through a 1/4-inch hose nipple connected to the release port in the brake cylinder cover, and make sure the brake can be rotated by hand.
- (8) Install clutch parts (45 through 52)

gear so that the lock pin fits into one of the holes in the gear.

- (9) If ball bearings (17) were removed from planet gears (18), use a suitable bearing pusher to bear on the outer races, and press the bearings into the gears. Using retaining ring pliers, install four retaining rings (16) in the planet gear grooves.
- (10) Install assembled planet gears (18) and ball bearings (17) onto the stubs of drive shaft (42). Using retaining ring pliers, install retaining rings (15) in the stub grooves, to lock the planet bearings in place.
- (11) Insert motor pinion gear (12) between the planet gears until meshed, and press or tap the gear into motor pinion ball bearing (41) installed in the bore of drive shaft (42).
- (12) Insert screws (7) through gear hous-

ing (52). Place a motor case gasket (13) over the screws, install casing cover (14), and place another motor case gasket (13) over the screws.

*Note.* Install casing cover (14) so the raised portion is facing outward, is perpendicular to the clutch lock handle.

- (13) Install assembled propelling air motor (10), and secure with lock washers (9) and nuts (8).
- (14) Install pipe plug (3) and magnetic plug (1) with gasket (2).
- (15) Install studs (6).

*Note.* If the traction drive is to be installed immediately, do not install washers (5) and nuts (4).

## 6-84. Installation

Install the complete traction drive as described in paragraph 5-17b.

# Section XIII. MAIN FRAME AND TRACK ASSEMBLY

## 6-85. General

This section contains repair instructions for the main frame and track assembly. This assembly forms the basic structure for the pneumatic drill, on which all of the various units are mounted. In addition, the lubricating oil reservoir is an integral part of the frame.

## 6-86. Disassembly

Disassemble main frame and track assembly in the numerical sequence as illustrated on figure 6-30. Note the following special procedures:

- a. Only if necessary to remove traction units (3, fig. 6-30), use a hoist to remove the weight of the frame from the traction units. Remove bolts (1) and nuts (2) to free the traction units from the frame.
- b. Only if necessary to remove tow hitch

(mum) under the frame to collect the rock dust and oil from the reservoir, and remove magnetic drain plug (7) with gasket (8) from the bottom of the reservoir.

- d. Remove remaining parts only as necessary.

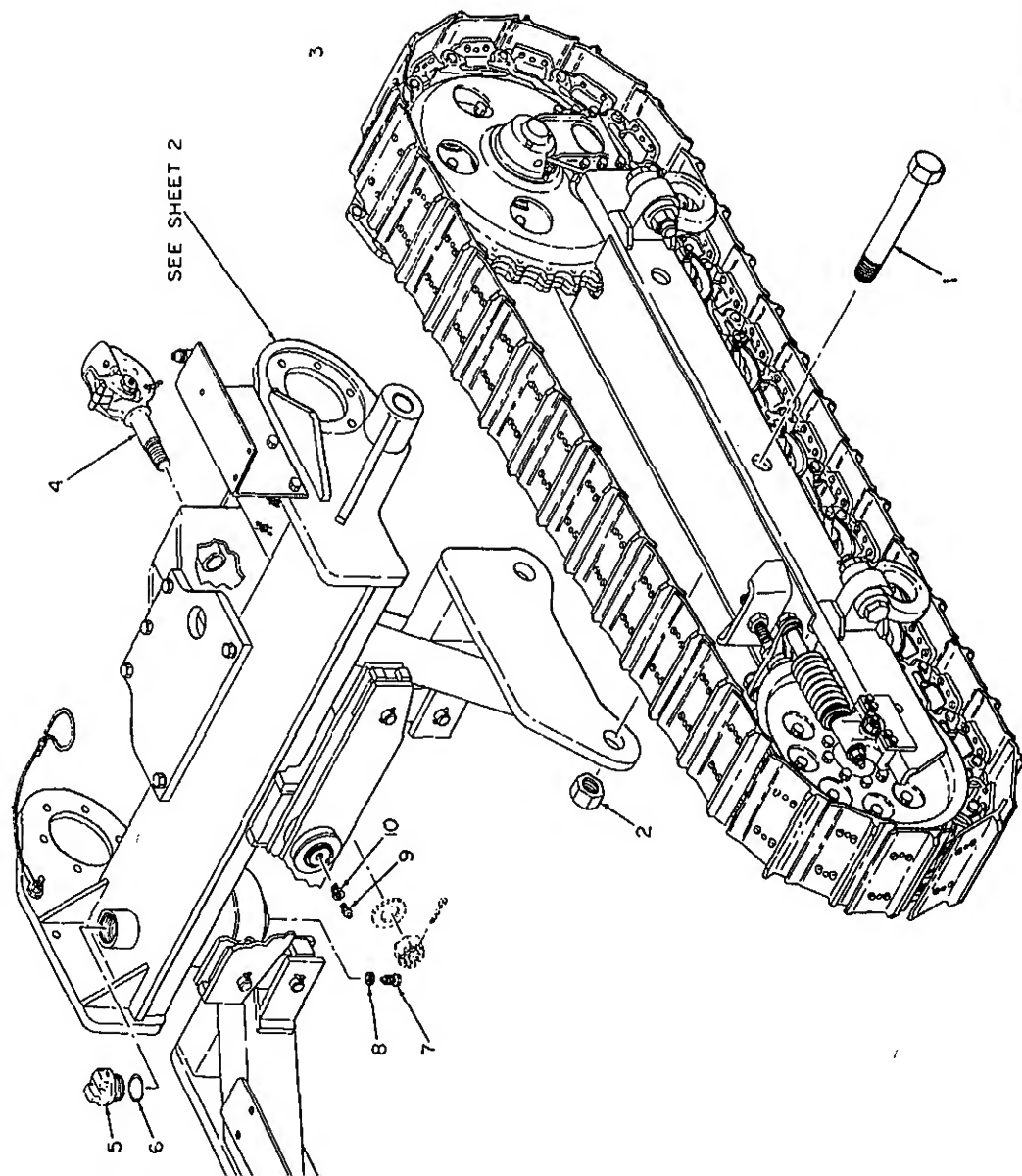
## 6-87. Cleaning

Clean all parts with an approved solvent and blow dry with compressed air.

## 6-88. Inspection and Repair

- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.





10 Reducing bushing, 1/4 to 1/8 in.

6 O-ring

6 O-ring, hex-hd, 1 3/4 x 1 1/2 in. (4)

7 Magnetic drain plug, 3/4-16

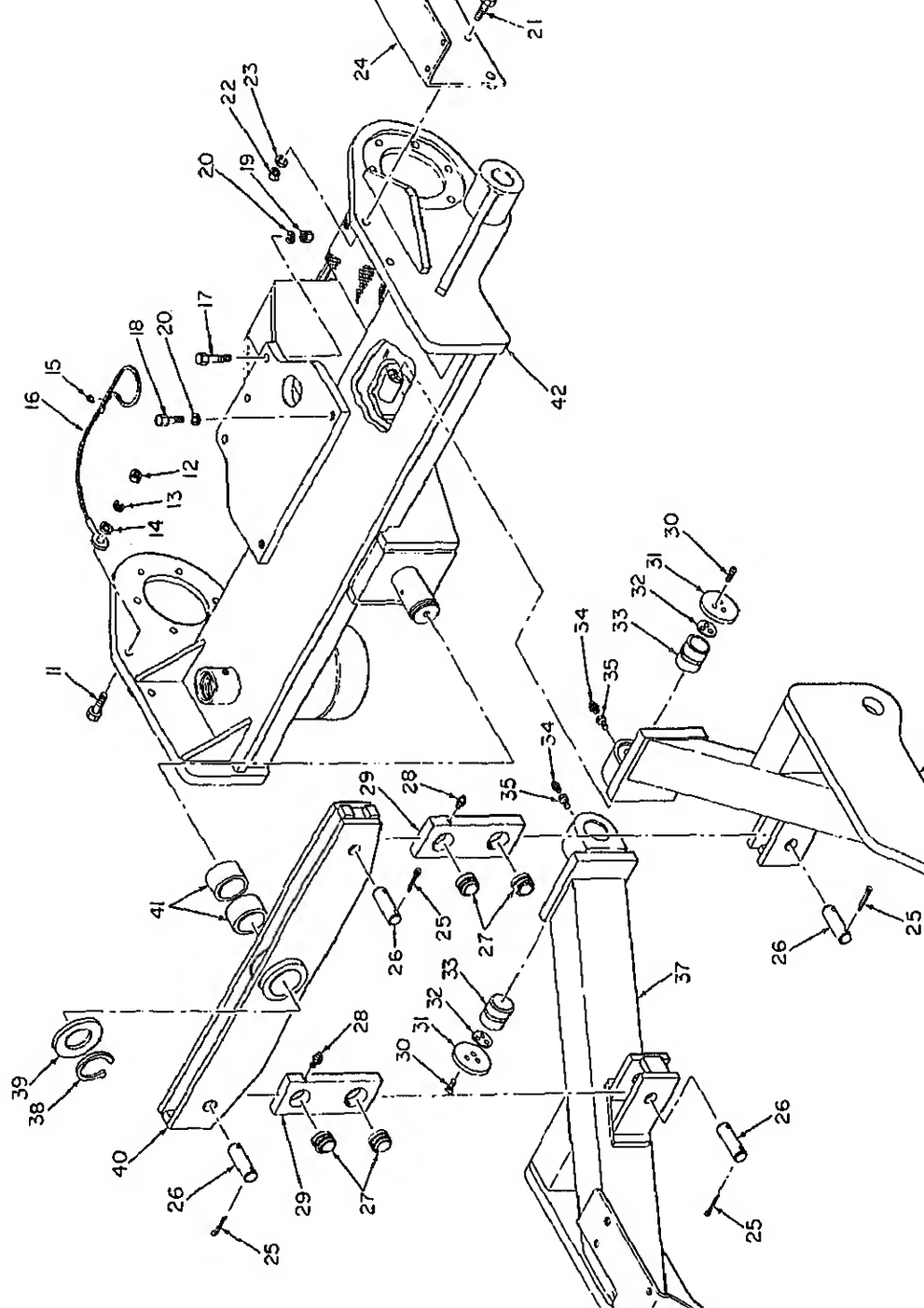
7 hex, 1 3/4-5 (4)

8 Gasket

ection unit (2)

Figure 6-30—Continued.

hitch



24	Hydraulic valve mounting bracket	35	Reducing bushing, 1/4 to 1/8 in. (2)
25	Cotter pin (8)	36	Strut, lh
26	Strut suspension link pin (4)	37	Strut, rh
27	Self-aligning bushing assembly (4)	38	Retaining ring
28	Lubrication fitting (4)	39	Yoke retaining washer
29	Suspension link (2)	40	Yoke
30	Screw, cap, socket-hd, 7/16-20 x 1 in. (6)	41	Yoke bushing (2)
31	Strut retainer (2)	42	Bare frame
32	Strut shaft spacer (4)		

Figure 6-30 (2)—Continued.

This section contains repair instructions for the traction units. The pneumatic drill uses two traction units, which are identical except for orientation, and quantities specified throughout this section are for one unit. All illustrations used depict the left-hand traction unit.

## 6-91. Removal

Remove the traction units as described in paragraph 6-86.

## 6-92. Disassembly

a. *General.* Disassemble traction unit in the numerical sequence as illustrated on figure 6-31. Note the following special procedures:

b. *Track Assembly.*

- (1) If necessary to remove track assembly (5, fig. 6-31), tow or propel the pneumatic drill until the track hookup pin (7) is at the rear, approximately half-way up the sprocket wheel of the final drive assembly (52).
- (2) Pry out track hookup pin lock pins (6).
- (3) Using a drift of a smaller diameter than the track hookup pin (7) and a backup plate to support the grouser, drive out the track hookup pin with a hammer.
- (4) Remove the track assembly either by hoisting the entire unit, or by propelling it until the track is free.

c. *Track Roller Assemblies.*

- (1) Remove the track assembly (para 6-92b).
- (2) Jack up the frame to allow clearance for track roller removal.
- (3) Remove self-locking nuts (19) (4 per roller), and lower the entire track roller assembly (23), with track roller

(5) Remove oil seals (26) by cutting them with a small sharp chisel and prying out.

(6) Pry off snap rings (27). Remove lubrication fittings (24) and reduce bushings (25).

(7) Support the assembly on flange of hub assembly (31). Using a hammer and a piece of bronze, protect the shaft, drive out track roller bushing retainers (28).

*Note.* Remove the retainer closest to the lubrication fitting first.

(8) If necessary to remove track roller bushings (29), drive a small chisel down along the split line, being careful not to damage any parts.

d. *Track Idler Assembly.*

- (1) Remove the track assembly (para 6-92b).
- (2) Remove nuts (16) and slide the track idler assembly and related parts off track frame channel assembly (53).
- (3) Remove self-locking nuts (54) and track roller adjusting forks (55).
- (4) Remove self-locking nuts (56), slide out assembled buffer spring parts (57 through 60).
- (5) After removing support guide plate (63) and track idler supports (64), remove oil seals (75) by cutting them with a small sharp chisel and prying out.
- (6) Pry off snap rings (76).

*Note.* If necessary to remove track idler flanges (74), be sure to first remove lubrication fittings (68) and reduce bushings (69).

(7) Support the assembly so that the track idler shaft (79) can be driven out. Install a nut (65) on the shaft to

#### **Final Drive Assembly.**

Remove the track assembly (para 6-92b).

After removing outer and inner support brackets (42 and 51), jack up the frame and remove final drive assembly (52).

*Note.* Use a chain hoist to support the final drive assembly.

Remove sprocket stud nuts (88) and lift out sprocket assembly (90) with collets (89) attached.

Remove hardware (93 through 97) and bearing retainer (98) with bearing retainer shims (99). Tie the shims together to facilitate reassembly.

Remove screws (100), dowel screws (101), cover plate assembly (106), and cover gasket (103). Discard the cover gasket.

Remove dust shield (104) from cover plate assembly (106) and tap out large oil seal (105).

Install a cap screw in the tapped hole of main drive shaft pinion (109). Using a pry bar and a support block, remove main drive shaft pinion (109) with complete inner and outer bearings (107 and 108) from shaft and spacer housing (110). Using a suitable bearing puller, remove the bearings from the pinion.

*Note.* Bearings (107, 108, 114, and 115) consist of two pieces each; an outer race and an inner race with roller, which are removable separately, but which are matched to each other and must be kept together. Do not intermix bearing races.

Remove track sprocket bearing shims (92) from shaft and spacer housing (110). Tie the shims together to facilitate reassembly.

assembly (117).

(11) Tapping lightly with a blunt-nosed drift, remove small oil seal (112), oil seal retainer (113), and complete outer ring gear bearing (114) from the hub of ring gear and hub assembly (117).

(12) Tapping lightly with a blunt-nosed drift, remove complete inner ring gear bearing (115) from the hub of ring gear and hub assembly (117).

### **6-93. Cleaning**

Clean all parts with an approved cleaning solvent and blow dry with compressed air.

### **6-94. Inspection and Repair**

a. Inspect all parts for wear and damage, and replace if necessary.

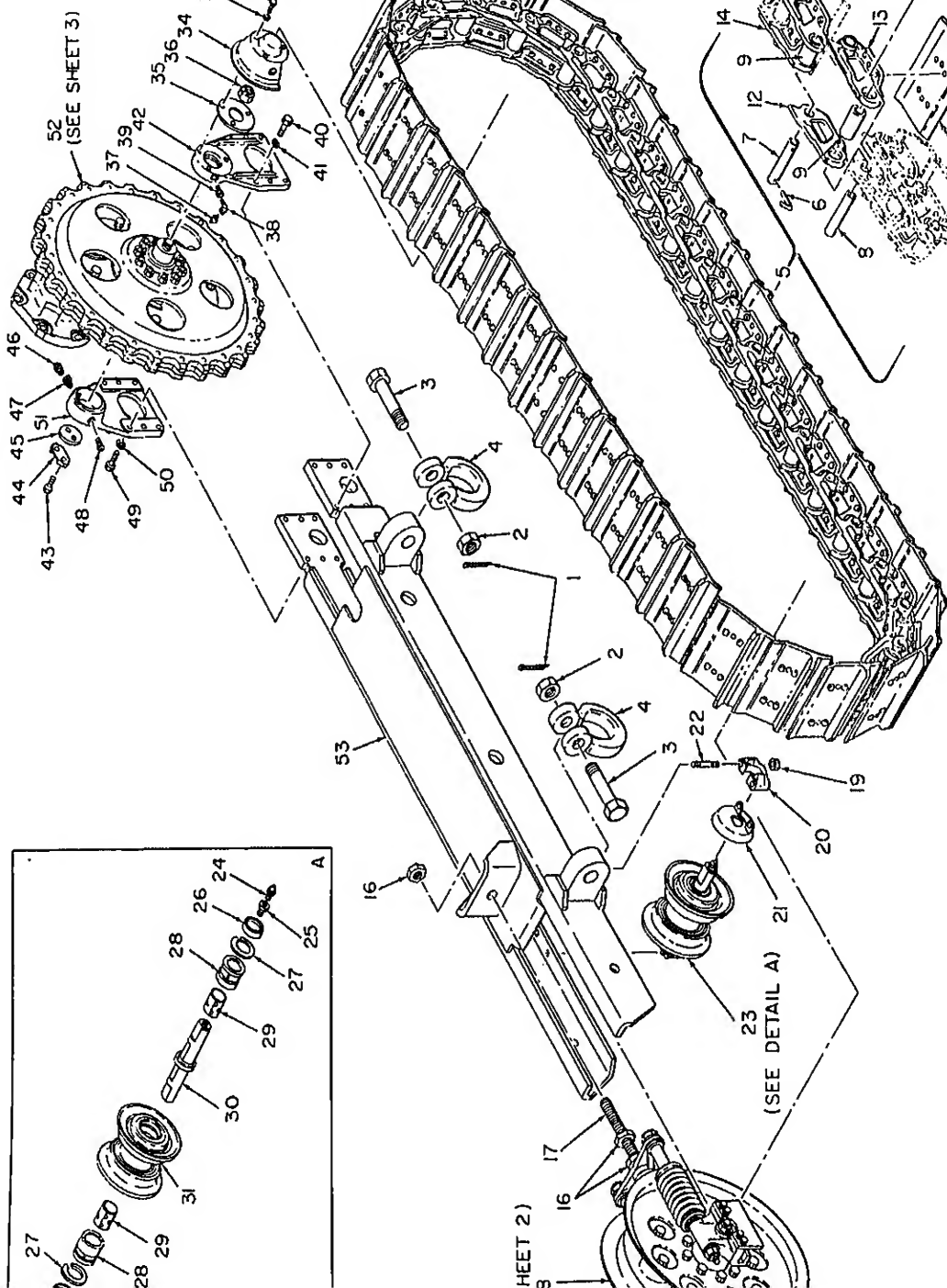
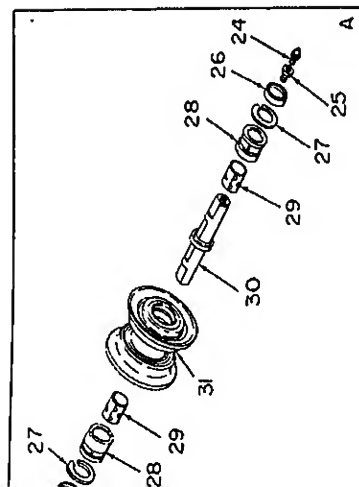
b. Inspect shaft and spacer housing (110, fig. 6-31), cover plate assembly (106), bearing retainer (98), track idler shaft (79), track idler supports (67), support guide plates (63), and buffer spring clamp rods (60) for cracks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove all minor nicks and burrs with a fine file or handstone, and retap or rechase all damaged threads. Replace the parts if damage cannot be repaired.

c. Inspect all gears and pinions for cracks, chipped teeth, damaged bores, and excessive wear. Replace if in doubt as to the serviceability of any part.

d. Inspect all bearings for cracks, looseness, and wear. Replace if unserviceable.

e. Inspect oil seals, wear plates, and oil seal retainers for scoring marks and excessive wear. Replace all unserviceable parts.

f. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.



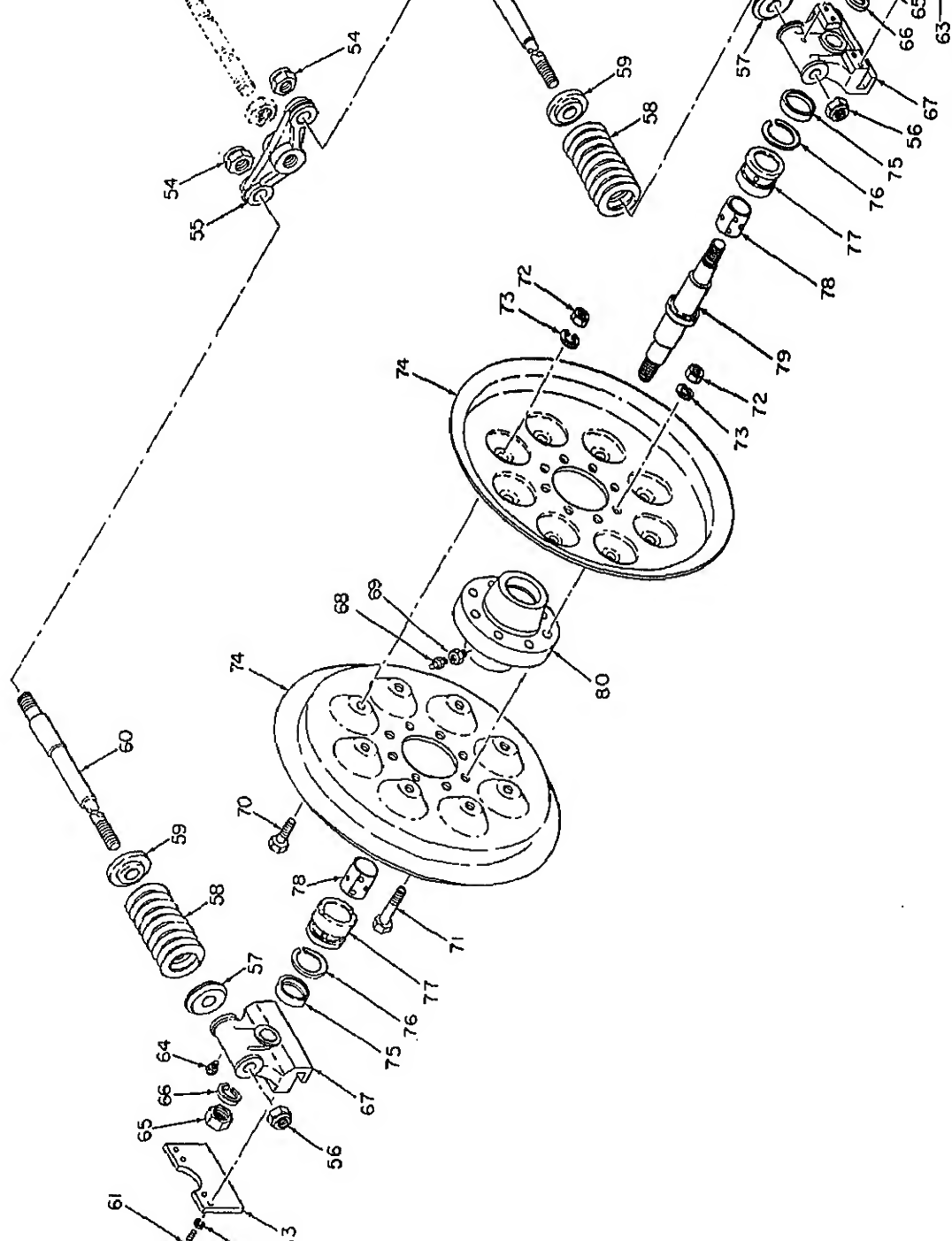
*Note.* This figure applies to both the left-hand and right-hand traction units, which are identical except for orientation. Quantities specified are for one unit (either left-hand or right-hand traction unit).

- 1 Cotter pin (2)
- 2 Nut, hex 1 3/8-6 (2)
- 3 Screw, cap, hex-hd, 1 3/8-6 x 6-5/16 in. (2)
- 4 Lifting and tie-down shackle (2)
- 5 Track assembly
- 6 Track hookup pin lock pin (2)
- 7 Track hookup pin
- 8 Track link pin (35)
- 9 Track link bushing (36)
- 10 Rivet (144)
- 11 Grouser (36)
- 12 Track hookup link, rh
- 13 Track hookup link, lh
- 14 Track link, rh (35)
- 15 Track link, lh (35)
- 16 Nut, hex, 1 1/8-7 (3)
- 17 Track idler adjusting screw
- 18 Track idler assembly and related parts
- 19 Nut, self-locking, hex, 1/2-20 (20)
- 20 Track roller shaft support (10)
- 21 Dust shield assembly (10)
- 22 Roller to track frame stud, 1/2-20 (20)
- 23 Track roller assembly (5)
- 24 Lubrication fitting (5)

- 25 Reducing bushing (5)
- 26 Oil seal (10)
- 27 Snap ring (10)
- 28 Track roller bushing retainer (10)
- 29 Track roller bushing (10)
- 30 Track roller shaft (5)
- 31 Flange and hub assembly (5)
- 32 Screw, cap, hex-hd, 5/16-18 x 5/8 in.
- 33 Washer, lock, 5/16 in. (3)
- 34 Dust shield
- 35 Dust shield gasket
- 36 Nut, hex, 1-14
- 37 Lubrication fitting
- 38 Elbow
- 39 Reducing bushing, 1/4 to 1/8 in.
- 40 Screw, cap, hex-hd, 1/2-13 x 1 3/4 in.
- 41 Washer, lock, 1/2 in. (6)
- 42 Outer support bracket
- 43 Screw, cap, hex-hd, 1/2-13 x 1 in. (6)
- 44 Lock plate
- 45 Track frame shaft retainer
- 46 Lubrication fitting
- 47 Reducing bushing, 1/4 to 1/8 in.
- 48 Pipe plug
- 49 Screw, cap, hex-hd, 1/2-13 x 2 in. (6)
- 50 Washer, lock, 1/2 in. (6)
- 51 Inner support bracket
- 52 Final drive assembly (lh shown, rh shown)
- 53 Track frame channel assembly

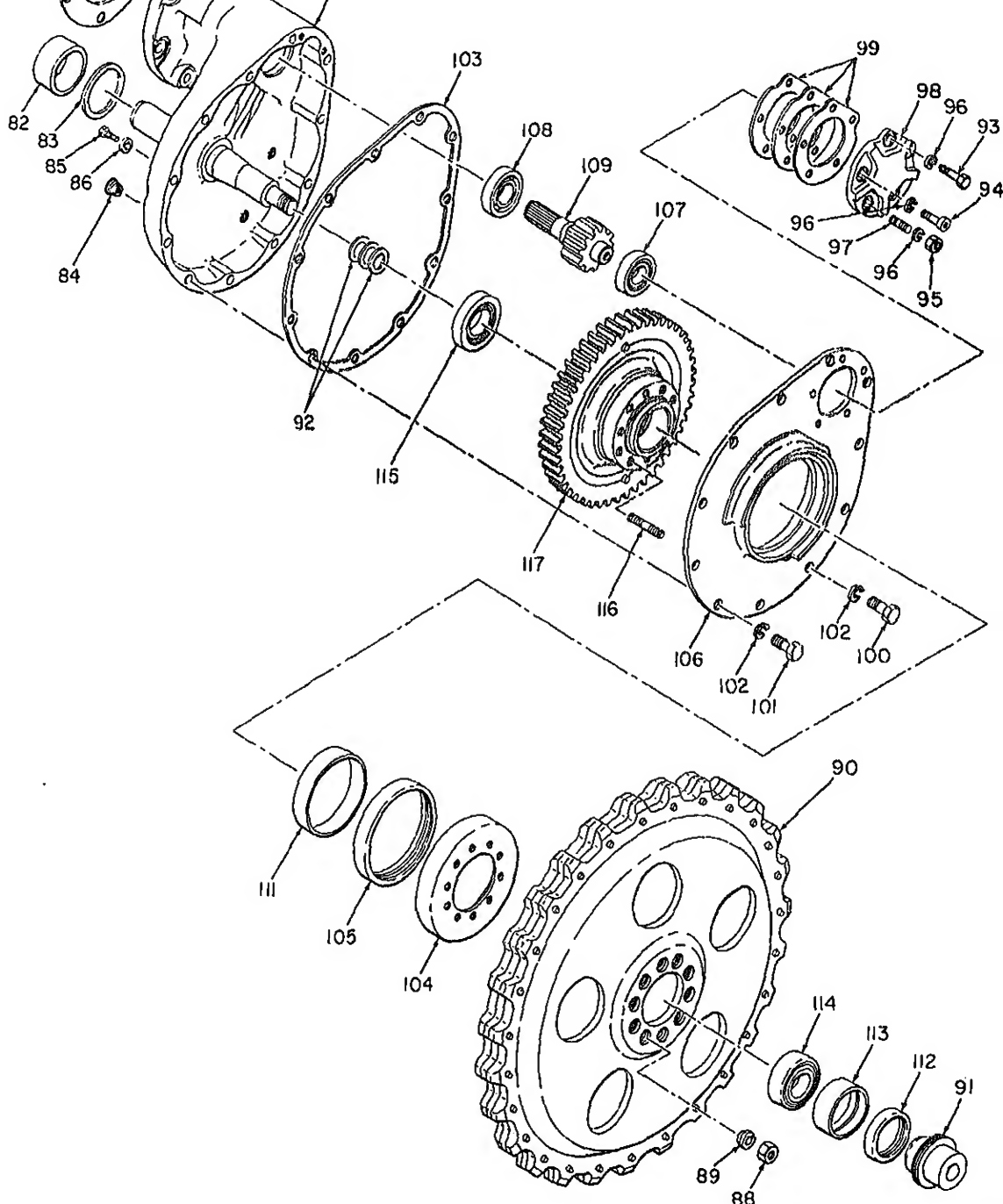
Figure 6-31(1).—Continued.





55	Track idler adjusting fork	
56	Nut, self-locking, hex, 3/4-16 (2)	
57	Buffer spring front seat (2)	
58	Buffer spring (2)	
59	Buffer spring rear seat (2)	
60	Buffer spring clamp rod	
61	Screw, cap, hex-hd, 3/8-16 x 1 1/2 in. (8)	
62	Washer, lock, 3/8 in. (8)	
63	Lubrication fitting (2)	
64	Nut, hex, 1-12 (2)	
65	Washer, lock, 1 in. (2)	
66	Track idler support (2)	
67	Lubrication fitting	
68	Reducing bushing, 1/4 to 1/8 in.	
69	Screw, cap, hex-hd, 1/2-20 x 1 1/2 in. (8)	
70	Screw, cap, hex-hd, 1/2-20 x 2 3/4 in. (8)	
71	Track idler flange (2)	
72	Oil seal (2)	
73	Snap ring (2)	
74	Track idler bushing retainer	
75	Track idler bushing (2)	
76	Track idler shaft	
77	Track idler hub	

Figure 6-31(2)—Continued.



Magnetic drain plug, 1/2 in.  
 Sprocket  
 Sprocket filler plug  
 Sprocket stud nut (10)  
 Sprocket (10)  
 Sprocket assembly  
 Shaft trunnion  
 Track sprocket bearing shims (as req)  
 Screw, cap, hex-hd, 3/8-16 x 1 1/4 in. (2)  
 Screw, cap, hex-hd, 3/8-24 x 1 in. (2)  
 Nut, hex, 3/8-24  
 Washer, lock, 3/8 in. (5)  
 Stud, 3/8-24 x 15/16 in.  
 Bearing retainer  
 Bearing retainer shim (as req)

104 Dust shield  
 105 Large oil seal  
 106 Cover plate assembly  
 107 Complete outer bearing  
 108 Complete inner bearing  
 109 Main drive shaft pinion  
 110 Shaft and spacer housing (lh shown rh opposite)  
 111 Oil seal wear plate  
 112 Small oil seal  
 113 Oil seal retainer  
 114 Complete outer ring gear bearing  
 115 Complete inner ring gear bearing  
 116 Track sprocket stud (10)  
 117 Ring gear and hub assembly

Figure 6-31(3)—Continued.

6-31. Note the following special provisions:

#### Final Drive Assembly.

Press large oil seal (105, fig. 6-31), into cover plate assembly (106), with the lip facing outward.

Press small oil seal (112) into the deep bore of oil seal retainer (113), with the lip facing the shallow bore of the retainer.

Tap or press the outer races of outer and inner ring gear bearings (114 and 115) into the hub of ring gear and hub assembly (117).

Tap or press the outer race of inner bearing (108) into the bore of shaft and spacer housing (110).

Using a suitable press and bearing pusher to bear on the inner races, install bearings (107 and 108) on main drive shaft pinion (109).

Tap or press the inner race and rollers of outer and inner ring gear bearings (114 and 115) in place on shaft and spacer housing (110).

Install ring gear and hub assembly (117) into shaft and spacer housing (110).

and spacer housing (110). Install the assembled small oil seal (112) and oil seal retainer (113) on the shaft. Install shaft trunnion (91) and secure with nut (36).

*Note.* If the shim thickness used previously cannot be determined, start with 0.125 inch thickness of shims.

(9) Engage the hook of a spring scale in a tooth of ring gear and hub assembly (117) as shown in figure 6-32 and check the pull against rotation of the gear. If the spring scale does not read between 6 to 8 pounds, add or remove track sprocket bearing shims (92, fig. 6-31) as required to obtain the correct reading.

(10) Carefully install oil seal wear plate (111) on the rim of ring gear and hub assembly (117), tapping the plate in place with a piece of wood. Be careful not to damage the plate.

(11) Install the assembled main drive shaft pinion (109) with bearings (107 and 108), into shaft and spacer housing (110).

(12) Align a new cover gasket (103) with

(102). (103) with lock washers

- (13) Loosen nut (36) enough to allow ring gear and hub assembly (117) to turn freely.
- (14) Install the same thickness of bearing retainer shims (99) as was removed during disassembly, over cover plate assembly (106). Install bearing retainer (98) and hardware (93 through 97).

*Note.* If the shim thickness used previously cannot be determined, start with 0.050 inch thickness of shims.

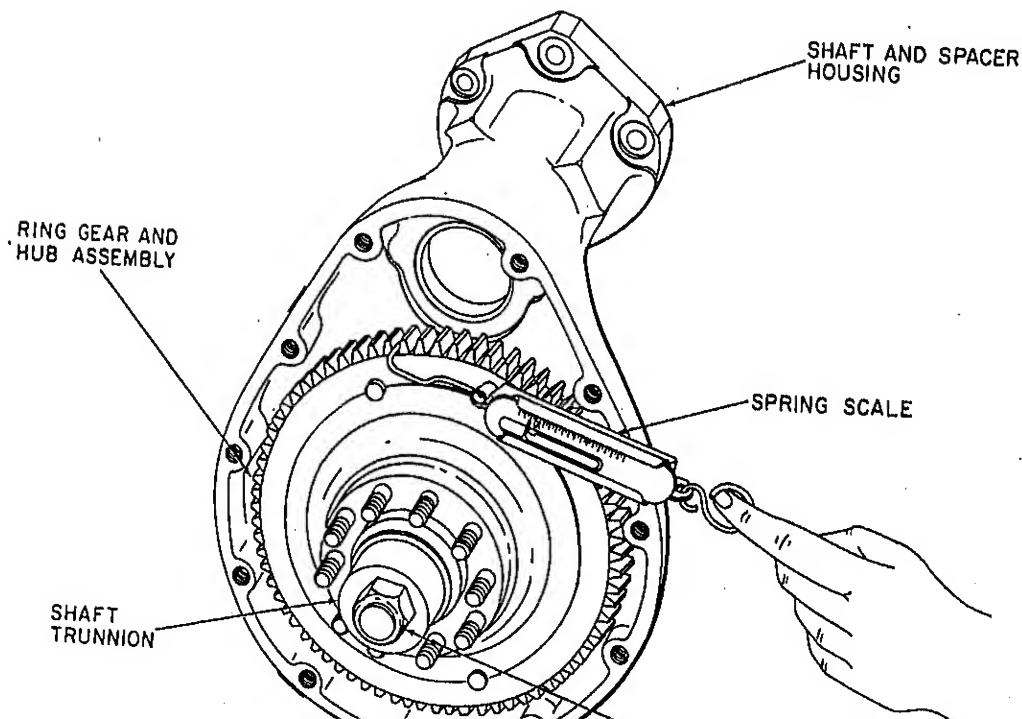
- (15) Wrap some string around the protruding (splined) end of main drive shaft pinion (109) and hook a spring scale on the string to check the pull against rotation of the main drive shaft pinion. If the drag is not be-

- (16) Remove nut (36) and shaft pinion (91). Install the assembly (112) and oil seal retainer (112) so that the deep bore corner of the oil seal is facing outward (the end of the shaft). Tap or drive the oil seal retainer until seated. Install the shaft trunnion (93) and nut (36). Tighten the nut so

- (17) Install dust shield (104) and sprocket assembly (90) and tighten stud nuts (88) to a torque of 100 pounds.

*Note.* After 100 hours of operation, check and retighten the sprocket assembly to the specified torque.

- (18) Jack up the frame and install the drive assembly (52) and re-



- Using a mallet, tap track idler bushing retainers (77) and track idler bushings (78) into track idler hub (80).
- 2) Install track idler shaft (79). Install snap rings (76) and oil seals (75).
- 3) If track idler flanges (74) were removed, install them on track idler hub (80). Tighten screws (70 and 71) evenly to make sure that the wheel will run true. Install reducing bushing (69) and lubrication fitting (68).
- 4) Install track idler supports (67) and support guide plates (63).
- 5) Install buffer spring parts (54 through 60).
- 6) Jack up the frame and install track assembly and related parts (18), with track idler adjusting screw (17) and nuts (16).
- 7) Check the assembled length of buffer springs (58) on both traction units to insure correct running alignment of the wheels. Set the assembled length of both buffer springs to 6 1/8 inches.

#### *Track Roller Assemblies.*

- 1) Using a vise and a hard wooden block, press track roller bushings (29) into track roller bushing retainers (28) so that the oil holes are aligned.
- 2) Using a suitable bearing driver, install the assembled bushings and retainers into flange and hub assembly (31), with the tapered ends toward

avoid binding.

- (4) Using a suitable bearing driver, oil seals (26) in place with the lip of the seals facing outward.
- (5) Install dust shield assemblies (27). Jack up the frame and install track roller shaft supports (20) with track roller assemblies (23), on roller track frame studs (22). Secure with self-locking nuts (19).

#### *e. Track Assembly.*

- (1) Loosen track adjusting nuts (16) if necessary.
- (2) Jack up the frame and mount track around the final drive sprocket, track idler, and track rollers, bringing the ends together.
- (3) Align the pin holes of left- and right-hand track hookup links (13 and 14) with a drift.
- (4) With track link bushing (9) installed and the outer track hookup pin (6) inserted in track hookup pin (7), place the hookup pin through the hookup links and bushing.
- (5) Turn the track hookup pin (7) until the holes are aligned with the slots in the link.
- (6) Insert and drive the track hookup pin (6) completely in until seated.
- (7) Adjust the tracks (para 3-36a).

## **6-96. Installation**

See figure 6-30 and install the traction unit

## **Section XV. TOW HITCH**

### **General**

This section contains repair instructions for tow hitch. The tow hitch may be used for

### **6-98. Removal**

Remove the tow hitch as described in paragraph 3-40.

- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damaged threads.

Retap or rechase threads if stripped or crossed, or replace if unserviceable.

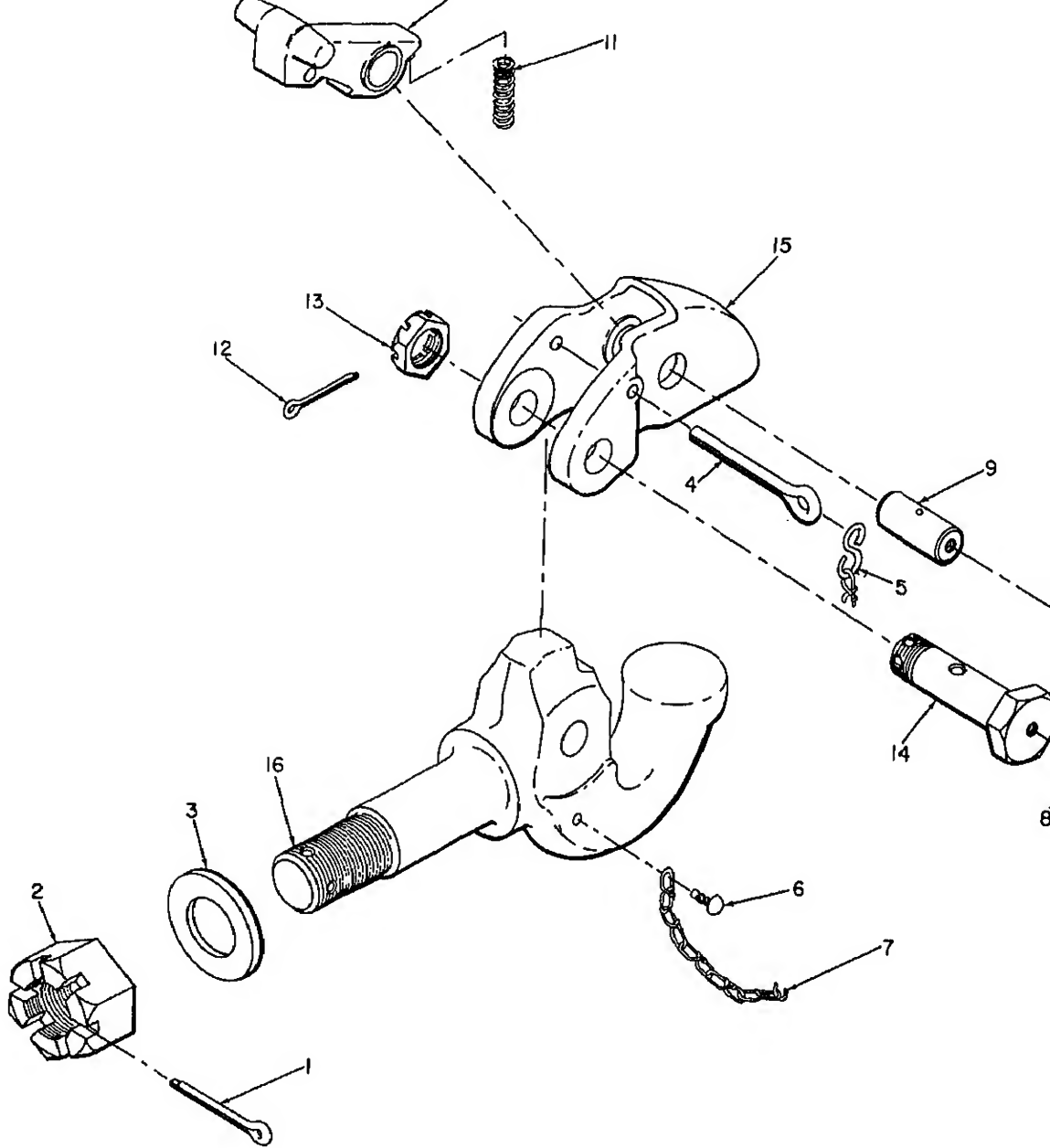
cal sequence as illustrated on figure 6-

### **6-103. Installation**

Install the tow hitch as described in paragraph 3-41.







S-link  
Drive screw  
Chain  
Lubrication fitting (2)

13 Nut, hex, slotted, 1-14  
14 Latch bolt, hex-hd, 1-14 x 3 7/8 in.  
15 Pintle lock  
16 Pintle

*Figure 6-33—Continued.*

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## APPENDIX A

### REFERENCES

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#### A-1. Fire Protection

TB 5-4200-200-10 Hand Portable Fire Extinguishers For Army Users

#### A-2. Lubrication

C9100IL Fuels, Lubricants, Oils and Waxes  
LO 5-3820-239-12 Department of the Army Lubrication Order for Drill, Frontal, and Crawler Mounted, Self-Propelled Ingersoll-Rand Model CMT-1A

#### A-3. Painting

TM 9-218 Painting Instructions for Field Use

#### A-4. Radio Suppression

TM 11-483 Radio Interference Suppression

#### A-5. Maintenance

TM 38-750 Army Equipment Record Procedures  
TM 5-3820-239-15 Department of the Army Operator, Organizational, Direct and General Support, and Depot Maintenance Manual  
TM 5-3820-239-20P Department of the Army Operator and Organizational Maintenance Repair Parts and Special Tools List Manual  
TM 5-3820-239-35P Department of the Army Direct and General Support and Depot Maintenance Repair Parts and Special Tools List Manual  
TM 5-764 Electric Motor and Generator Repair

#### A-6. Shipment and Storage

TB 740-93-2 Preservation of USAMEC Mechanical Equipment for Shipment and Storage  
TB 740-93-3 Administrative Storage of USAMEC Mechanical Equipment



# APPENDIX B

## BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES

### Section I. INTRODUCTION

#### 3-1. Scope

This appendix lists items which accompany the pneumatic drill or are required for installation, operation, or operator's maintenance.

#### 3-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items—Section II is a list of items which accompany the pneumatic drill or are required for the installation, operation, or operator's maintenance.

b. Maintenance and Operating Supplies—Section III is a listing of maintenance and operating supplies required for initial operation.

#### 3-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column (1):

- (1) Source Code, indicates the selection status and sources for the listed item. Source codes are:

Code	Explanation
	of two or more units, each of which carries individual stock numbers and descriptions and are procured and stocked separately. They can be assembled by units at indicated maintenance categories.
X	Applied to parts and assemblies which are not procured or stocked, the mortality of which is normally below that of the applicable end item, and the failure of which should result in retirement of end item from the supply system.
X1	Applied to repair parts which are not procured or stocked, the requirement for which will be supplied by use of next higher assembly or component.
X2	Applied to repair parts which are stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization; if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.
C	Applied to repair parts authorized for local procurements. If not obtainable from local procurement, such repair parts will be requisitioned through normal supply channels with a supporting statement of nonavailability from local procurement.
G	Applied to major assemblies that are procured with PEMA (Procurement Equipment Missile Army) funds for initial issue only to be used as exchange assemblies.

turned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

*b. Federal Stock Number, Column (2).* This column indicates the Federal stock number for the item.

*c. Description, Column (3).* This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

*d. Units of Issue, Column (4).* This column indicates the unit used as a basis for issue, e.g., pr, ft, yd, etc.

*e. Quantity Incorporated in Unit Pack, Column (5).* This column indicates the actual quantity contained in the unit pack.

*f. Quantity Incorporated in Unit, Column (6).* This column indicates the quantity of the item used in the functional group.

*g. Quantity Furnished With Equipment, Column (7).* This column indicates the quantity of an item furnished with the equipment.

- (1) *Figure Number, column 9a.* Indicates the figure number of the illustration in which the item is shown.
- (2) *Item Number, column 9b.* Indicates the callout number used to reference the item in the illustration.

#### B-4. Explanation of Columns in the Table of Maintenance and Operating Supplies—Section III

*a. Component Application, Column (1).* This column identifies the component application of each maintenance or operating supply item.

*b. Federal Stock Number, Column (2).* This column indicates the Federal stock number for the item and will be used for requisitioning purposes.

*c. Description, Column (3).* This column indicates the item and brief description.

*d. Quantity Required for Initial Operation, Column (4).* This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

*e. Quantity Required for 8 Hours Operation, Column (5).* This column indicates the estimated quantities required for an average of 8 hours of operation.

*f. Notes, Column (6).* This column indicates informative notes keyed to data appearing in a preceding column.

#### B-5. Federal Supply Code for Manufacturers

Code	Manufacturer
30760----	Ingersoll-Rand Co. New York, New York
88038----	Alemite Corp. Long Island City, New York
93343----	Oliver Corp. Charles City, Iowa

# Section II. BASIC ISSUE ITEMS LIST

Qty. and Unit (C) R	(2) Federal stock No.	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit	(7) Qty turn in with equip	(8) Qty auth	(9) In the unit No.
		GROUP 31—BASIC ISSUE ITEMS MANUFACTURED BY TURER INSTALLED.						
		3100—BASIC ISSUE ITEMS MANUFACTURED BY TURER OR DEPOT INSTALLED.						
	7510-889-3494	Binder, loose leaf: U.S. Army Equipment Log Book	Ea			1	1	
	7520-559-9618	Case, Maintenance and Operational Manuals, cotton duck, water repellent, mildew resistant, MIL-B-117438.	Ea			1	1	
		Department of the Army Organizational, Direct and General Support, and Depot Maintenance Manual, TM 5-3820-239-15.	Ea			1	1	
		Department of the Army Operator and Organizational Maintenance Repair Parts and Special Tools List Manual, TM 5-3820-239-20P.	Ea			1	1	
		GROUP 32—BASIC ISSUE ITEMS, TROOP INSTALLED.						
		3200—BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED.						
		Wrench, Track Adjusting (93343) 112659	Ea			1	1	
		Wrench, 1 inch Open End (30760) 1013	Ea			1	1	
		Wrench, 1 5/16 inch Open End (30760) 8A	Ea			1	1	
		Gun, Grease (88033) 4040	Ea			1	1	
		Gun, Oil (88033) 4032	Ea			1	1	
		Hose Assembly, Grease Gun (88033) 6652A	Ea			1	1	



# Section III. MAINTENANCE AND OPERATING SUPPLIES

ent ion	(2) Federal stock number	(3) Description	(4) Quantity required for initial operation	(6) Quantity required for h operation	(6) Notes
(1)		Lubricating Oil Gear: 5 gal drum as follows:			(1) Includes quantity gear oil for b units.
	9150-577-5844 (2)	GO-90	3 qt	(3)	(2) See C91001L for tional data a questing proo
	9150-257-5440 (2)	GOS	3 qt	(3)	(3) See current L.C.
raulic otr	9150-265-9428 (2)	Oil, Lubricating: 5 gal pail as follows: OEID	40 qt (4)	(3)	grade applica replenishment vals.
	9150-242-7603 (2)	OES	40 qt (4)	(3)	(4) Reservoir capac (5) Average oil con tion is 1 qt p of operation.
ifold ator	9150-265-9435 (2)	Oil, Lubricating: 5 gal pail as follows: OE 30	8 qt (4)	(5)	
	9150-265-9428 (2)	OE 10	8 qt (4)	(5)	
	9150-242-7603 (2)	OES	8 qt (4)	(5)	
Feed (1)	9150-577-5844 (2)	Lubricating Oil Gear: 5 gal drum as follows: GO-90		(3)	
	9150-257-5440 (2)	GOS		(3)	
elling otor (1)	9150-265-9435 (2)	Oil Lubricating 5 gal drum as follows: OE-30	2 qt	(3)	
	9150-265-9428 (2)	OE-10	2 qt	(3)	
		Grease, Molybdenum			

(1) Component Location	(2) Federal stock number	(3) Description	(4) Quantity required if initial operation	(5) Quantity required if/8 hrs operation	(6) Notes
Points	9150-190-0955 (2)	Grease, automotive and artillery: 5 lb can as follows: GAA		(3)	



# APPENDIX C

## MAINTENANCE ALLOCATION CHART

### Section I. INTRODUCTION

#### 1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance operations on the identified end item or component. The implementation of the maintenance tasks upon the end item or component will be consistent with the assigned maintenance operations.

c. Section III lists the special tools and test equipment required for each maintenance operation as referenced from section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

#### 2. Explanation of Columns in Section II

a. *Functional Group Number.* The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed on the Maintenance Assignment in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. *Component Assembly Nomenclature.* This column contains a brief description of the components of each functional group.

c. *Maintenance Functions and Maintenance*

tions for the various maintenance categories are as follows:

- C—Operator or crew
- O—Organizational maintenance
- F—Direct support maintenance
- H—General support maintenance
- D—Depot maintenance

The maintenance functions are defined as follows:

A—INSPECT: Verify serviceability and detect incipient electrical or mechanical failure by close visual examination.

B—TEST: Verify serviceability and detect incipient electrical or mechanical failure by measuring mechanical or electrical characteristics of the item and comparing those characteristics with authorized standards. Tests will be made commensurate with test procedures with calibrated tools and test equipment referenced in the Maintenance Assignment.

C—SERVICE: Operations required periodically to keep the item in proper operating condition, i.e., clean, preserve, drain, pack and replenish fuel, lubricate, hydraulic, and deicing fluid or compressed air supplies.

D—ADJUST: Regulated periodically to prevent malfunction. Adjustments will be made commensurate with adjustment procedures and associated equipment adjustment specifications.

E—ALIGN: Adjust two or more components from electrical or mechanical

**F—CALIBRATE:** Determine, check, or rectify the graduation of an instrument, weapon, or weapons system or components of a weapons system.

**G—INSTALL:** Remove and install the same item for service or when required for the performance of other maintenance operations.

**H—REPLACE:** Substitute serviceable components, assemblies and subassemblies for unserviceable counterparts.

**I—REPAIR:** Restore to a serviceable condition by replacing unserviceable parts or by any other action required using available tools, equipment and skills, including welding, grinding, riveting, straightening, adjusting and facing.

**J—OVERHAUL:** Restore an item to a completely serviceable condition (as prescribed by serviceability standards developed and published by the commodity commands) by employing techniques of "Inspect and Repair Only As Necessary" (IROAN). Maximum use of diagnostic and test equipment is combined with minimum disassembly during overhaul. "Overhaul" may be assigned to any level of maintenance except organizational, provided the time, tools, equipment, repair parts authorization, and technical skills are available at that level. Normally, overhaul as applied to end items, is limited to depot maintenance level.

**K—REBUILD:** Restore to a condition comparable to new by disassembling to determine the condition of

each component part and assembling using service rebuilt, or new assemblies, and parts.

*d. Reference Note.* This column, subdivided into columns L and M, is provided for referencing the Special Tool and Test Equipment Requirements (sec. III) and Remarks (sec. IV) that may be associated with maintenance functions (sec. II).

### C-3. Explanation of Columns in Section I

*a. Reference Code.* This column consists of a number and a letter separated by a dash. The number references the Tools and Equipment Requirements column on the Maintenance Assignment. The letter represents the special maintenance function the item is to be performed with. The letter is representative of columns A through K on the Maintenance Assignment.

*b. Maintenance Category.* This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

*c. Nomenclature.* This column lists the name or identification of the tool or test equipment.

*d. Tool Number.* This column lists the manufacturer's code and part number, or Federal stock number of tools and test equipment.

### C-4. Explanation of Columns in Section II

*a. Reference Code.* This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column M and the second letter references a maintenance operation, columns A through K.

*b. Remarks.* This column lists information pertinent to the maintenance operation being performed, as indicated on the Maintenance Assignment section II.

	Component assembly nomenclature	INSPECTION	TEST	SERVICE	ADJUST	ALIGN	CALIBRE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD	Tools and equipment	Remarks
11	REAR AXLE													
1103	Final Drive -----	C	--	--	--	--	--	--	F	F				
13	TRACKS													
1301	Suspension System:													
	Suspension assembly, track ----	C	--	--	--	--	--	--	F	F				
1302	Track Support Rollers and Brackets:													
	Roller assembly, support bushings -----	C	--	--	--	--	--	--	F	F				
1303	Track Idlers and Brackets:													
	Idler assembly, track adjuster -	C	--	--	--	--	--	--	F	F				
1304	Track Drive Sprocket:													
	Sprocket, drive -----	C	--	--	--	--	--	--	F	F				
1305	Track Assembly													
	Plate, assembly -----	C	--	--	--	--	--	--	F	F				
15	FRAME													
1501	Frame Assembly:													
	Deck assembly -----	C	--	--	--	--	--	--	F	F				
	Crossbar, struts -----	C	--	--	--	--	--	--	F	F				
1503	Towing Attachments:													
	Hitch, towing -----	C	--	--	--	--	--	--	O					
22	BODY CHASSIS OR HULL, AND ACCESSORY ITEMS													
2210	Data Plates:													
	Plates, data -----	C	--	--	--	--	--	--	F					
	Plates, instruction -----	C	--	--	--	--	--	--	F					
43	HYDRAULIC													
4301	Hose, Pipe Fittings, Tubing:													
	Hose and fittings -----	C	--	--	--	--	--	--	O					
	Tender assembly, hose support --	C	--	--	--	--	--	--	O					
4302	Pump and Pump Drive:													
	Coupling, flexible -----	C	--	--	--	--	--	--	O					
	Pump, hydraulic -----	C	F	--	--	--	--	--	O	F				
4305	Manifold and/or Control Valves:													
	Valve, master control -----	C	--	--	--	--	--	--	O	F				
	Valve, knee action and turret swing -----	C	--	--	--	--	--	--	O	F				
4307	Hydraulic Cylinders -----	C	--	--	--	--	--	--	O	F				
4308	Reservoir -----	C	--	C	--	--	--	--						A
50	PNEUMATIC EQUIPMENT													
5006	Lubrication System:													
	Cap and fill tube -----	C	--	--	--	--	--	--	O					
	Plug, drain -----	--	--	--	--	--	--	--	O	F				B
	Lubricator, air line -----	--	--	--	C	--	--	--	O					
5008	Air Intakes:													
	Hoses, fittings, manifolds -----	C	--	--	--	--	--	--	O					
	Strainer, air -----	C	--	C	--	--	--	--	O					
	Valve, shut-off -----	C	--	--	--	--	--	--	O					
5019	Pneumatic Motor Assembly:													
	Drill assembly, drifter, -----								O	F	F			

Item number	Component assembly nomenclature	INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD	Tools and equipment	Remarks
019	Pneumatic Motor Assembly: Motor, feed ----- Gear case, feed motor ----- Gear case, tramming motor ----- Clutch, throw-out, tramming motor -----	F F F ---	-- -- -- --	-- C C --	-- -- -- --	-- -- -- --	-- -- -- --	-- -- -- --	O F F F	F F F F				
020	Governor Pneumatic Motor: Control, feed motor ----- Control, tramming motor ----- Control, drifter rotation -----	F F F	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	O O O	F F F				
	EARTH MOVING EQUIPMENT COMPONENTS													
473	Lift and Swing Mechanism: Bearing plate, turret ----- Boom assembly ----- Dumprank assembly ----- Pin, boom bushing ----- Pin, dump cylinder and turret ----- Turret -----	C C C C C C	-- -- -- -- -- --	-- -- -- -- -- --	-- -- -- -- -- --	-- -- -- -- -- --	-- -- -- -- -- --	-- -- -- -- -- --	F F F F O F	F F F F F F				
476	Feed and Leveling: Carriage assembly ----- Centralizer ----- Chain ----- Slide, drill mounting ----- Sprockets, chain ----- Sprocket, gear case -----	-- -- -- C C F	-- -- -- -- -- --	-- -- -- -- -- --	-- -- -- O -- -- --	-- -- -- -- -- --	-- -- -- -- -- --	-- -- -- -- -- --	F O O O O F	F O O O O F				
477	Hand Control and Linkage: Control, assembly, pump ----- Cables, hand control ----- Levers, hand control -----	C C C	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	O O O	O O O				

### Section III. SPECIAL TOOL AND TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool number
		No special tools or test equipment required.	

### Section IV. REMARKS

Reference code	Remarks
A — A R — H	Service only Repair includes installation and maintenance

# INDEX

	Paragraph	Page
Adding extension rods -----	2-11	2
Adjustments:		
Automatic brakes -----	3-38	3
Feed chain -----	3-25	3
Lubricator valve -----	3-10	3
Track -----	3-36	3
Air feed motor:		
Cleaning -----	6-11	6
Disassembly -----	6-10	6
General -----	3-51	3
Inspection and repair -----	6-12	6
Installation -----	3-53	6
Lubrication -----	3-14	3
Reassembly -----	6-13	6
Removal -----	3-52	3
Tabulated data -----	1-4	1
Air piping diagrams -----	1-4	1
Automatic brakes:		
Adjustment -----	3-38	3
General -----	3-37	3
Auxiliary items -----	5-18	5
Basic issue items list -----		B
Basic issue tools and equipment -----		B
Boom base assembly:		
Cleaning -----	6-74	6
Disassembly -----	6-73	6
General -----	6-71	6
Inspection and repair -----	6-75	6
Installation -----	5-16	5
Reassembly -----	6-76	6
Removal -----	5-16	5
Boom lift cylinder:		
Cleaning -----	6-67	6
Disassembly -----	6-66	6
Inspection and repair -----	6-68	6
Installation -----	3-47	3
Reassembly -----	6-69	6
Removal -----	3-46	3
Tabulated data -----	1-4	1
Boom swing cylinder:		
Cleaning -----	6-67	6
Disassembly -----	6-66	6
Disassembly -----	6-68	6



Inspection and repair .....	6-12
Installation .....	3-81
Reassembly .....	6-13
Removal .....	3-30
Tabulated data .....	1-4
Checking oil levels:	
Hydraulic reservoir .....	3-12
Lubricating oil reservoir .....	3-9
Complete drill guide:	
Cleaning .....	6-11
Disassembly .....	6-10
Inspection and repair .....	6-12
Reassembly .....	6-13
Complete drill mounting:	
Cleaning .....	6-11
Disassembly .....	6-10
General .....	6-8
Inspection and repair .....	6-12
Installation .....	5-12
Reassembly .....	6-13
Removal .....	5-12
Complete traction drive:	
Cleaning .....	6-81
Disassembly .....	6-80
General .....	6-78
Inspection and repair .....	6-82
Installation .....	5-17
Lubrication .....	3-11
Reassembly .....	6-88
Removal .....	5-17
Compressor requirements .....	1-3
Controls and instruments .....	2-9
Daily preventive maintenance .....	3-6
Description:	
Drilling .....	1-3
Drifter drill positioning .....	1-3
General .....	1-3
Pneumatic drill .....	1-3
Propelling controls .....	1-3
Towing .....	1-3
Trimming .....	1-3
Difference in models .....	1-5
Dimensions and weight .....	1-4
Disengaging clutch .....	2-5
Dismantling for movement .....	2-6
Drifter drill:	
Cleaning .....	6-4
Disassembly .....	6-3
General .....	3-32
Inspection and repair .....	6-5
Installation .....	3-34

Cleaning	6-60
Disassembly	6-59
Inspection and repair	6-61
Installation	3-47
Reassembly	6-62
Removal	3-46
Tabulated data	1-4
Drill mounting plate:	
Cleaning	6-11
Disassembly	6-10
Inspection and repair	6-12
Reassembly	6-13
Drilling	2-11
Dump cylinder:	
Cleaning	6-53
Disassembly	6-52
Inspection and repair	6-54
Installation	3-47
Reassembly	6-55
Removal	3-46
Tabulated data	1-4
Feed chain:	
Adjustment	3-25
Cleaning	3-27
General	3-24
Inspection	3-27
Installation	3-28
Removal	3-28
Tabulated data	1-4
Filling hydraulic reservoir	3-12
Filling lubricating oil reservoir	3-9
Final drive:	
Disassembly	6-92
Reassembly	6-95
Hydraulic boom assembly:	
Cleaning	6-67
Disassembly	6-66
General	6-64
Inspection and repair	6-68
Installation	5-15
Reassembly	6-69
Removal	5-15
Hydraulic cylinders:	
General	3-45
Installation	3-47
Removal	3-46
Tabulated data	1-4
Hydraulic piping diagram	1-4
Hydraulic pump:	
Cleaning	6-18
Disassembly	6-17

Hydraulic pump assembly:	
Cleaning .....	6-18
Disassembly .....	6-17
General .....	3-42, 6-15
Inspection and repair .....	6-19
Installation .....	3-44
Reassembly .....	6-20
Removal .....	3-43
Hydraulic pump coupling:	
Installation .....	3-44
Removal .....	3-43
Tabulated data .....	1-4
Hydraulic reservoir:	
Checking oil level .....	3-12
General .....	3-22
Servicing .....	3-23
Hydraulic valve:	
Cleaning .....	6-25
Disassembly .....	6-24
Inspection and repair .....	6-26
Reassembly .....	6-27
Tabulated data .....	4-4
Hydraulic valve assembly:	
Cleaning .....	6-25
Disassembly .....	6-24
General .....	3-57, 6-22
Inspection and repair .....	6-26
Installation .....	3-59
Reassembly .....	6-27
Removal .....	3-58
Identification plate .....	1-4
Inspecting and servicing equipment .....	2-3
Installation of separately packed components .....	2-4
Installation or setting up instructions .....	2-5
Lifting pneumatic drill .....	2-1
Lubricating oil reservoir maintenance .....	3-9
Lubrication:	
Air feed motor .....	3-14
Detailed information .....	3-4
General .....	3-3
Propelling air motors .....	3-11
Traction drive .....	3-11
Traction unit .....	3-13
Lubricator metering valve setting .....	3-10
Main air valve:	
Cleaning .....	6-32
Disassembly .....	6-31
General .....	3-48, 6-29
Inspection and repair .....	6-33
Installation .....	3-50
Reassembly .....	4-34

Inspection and repair	6-88	6
Reassembly	6-89	6
Maintenance allocation chart		6
Maintenance and operating supplies		1
Manifold lubricator:		
Cleaning	6-32	6
Disassembly	6-31	6
General	3-48, 6-29	3-24, 6
Inspection and repair	6-33	6
Installation	3-50	3
Reassembly	6-34	6
Removal	3-49	3
Filter service	3-4	
Operation:		
Dusty or sandy areas	2-16	2
Extreme cold	2-14	2
Extreme heat	2-15	2
General	2-10	
High altitudes	2-18	2
Moist or humid conditions	2-17	2
Salt water areas	2-18	2
Starting	2-11	
Stopping	2-12	
Usual conditions	2-13	2
Conditioning the drill guide	2-11	
Power dump and swing assembly:		
Cleaning	6-53	6
Disassembly	6-52	6
General	6-50	6
Inspection and repair	6-54	6
Installation	5-14	
Reassembly	6-55	6
Removal	5-14	
Power guide extension mounting:		
Cleaning	6-60	6
Disassembly	6-59	6
General	6-57	6
Inspection and repair	6-61	6
Installation	5-13	
Reassembly	6-62	6
Removal	5-13	
Preventive maintenance services:		
Daily	3-6	
General	3-5	
Quarterly	3-7	
Drumming (see tramming)		
Drumming air motor:		
Cleaning	6-81	6
Disassembly	6-80	6
Inspection and repair	6-82	6
Lubrication	3-11	

Reassembly	6-41	
Removal	8-61	
Tabulated data	1-4	
Propelling motor control valve (see propelling controls)		
Quarterly preventive maintenance	8-7	
Record and report forms	1-2, 4-2	1-1
References		
Installation after movement	2-7	
Releasing brakes	2-5	
Shut-off control manifold:		
Cleaning	6-11	
Disassembly	6-10	
General	8-54	
Inspection and repair	6-12	
Installation	8-58	
Reassembly	6-18	
Removal	8-55	
Repair and replacement standards	4-4	
Suction line oil filter:		
Cleaning	6-46	
Disassembly	6-45	
General	6-48	
Inspection and repair	6-47	
Installation	6-49	
Reassembly	6-48	
Removal	6-44	
Servicing	3-4	
Tabulated data	1-4	
Scope		
Direct and general support and depot maintenance instructions	4-1	
Operator and organizational maintenance instructions	1-1	
Setting lubricator metering valve	8-10	
Special tools and equipment	8-1, 5-1	8-1
Specially designed tools and equipment	5-2	
Starting procedure	2-11	
Stopping procedure	2-12	
Suction oil filter service	3-4	
Swinging cylinder:		
Cleaning	6-53	
Disassembly	6-52	
Inspection and repair	6-54	
Installation	8-47	
Reassembly	6-55	
Removal	8-46	
Tabulated data	1-4	
Tabulated data	1-4, 4-4	1-2
Throttle valve:		
Cleaning	6-46	
Disassembly	6-45	
General	8-48	

ue data	1-4	
hitch:		
eaning	6-100	
asassembly	6-99	
neral	3-89, 6-97	3-1
spection and repair	6-101	
stallation	8-41	
asassembly	6-102	
moval	3-40	
culated data	1-4	
ng the pneumatic drill	1-3, 2-5	1
k assembly:		
justment	3-86	
asassembly	6-92	
asassembly	6-95	
k idler assemblies:		
asassembly	6-92	
asassembly	6-95	
k roller assemblies:		
asassembly	6-92	
asassembly	6-95	
tion drive (see complete traction drive)		
tion unit:		
eaning	6-93	
asassembly	6-92	
neral	3-35, 6-90	3-1
spection and repair	6-94	
brication	3-18	
asassembly	6-95	
rving	3-36	
culated data	4-4	
ack adjustment	3-36	
uning	1-3, 2-5	1
bleshooting	3-15-3-21, 5-3-5-10	3-1 5
ading equipment	2-1	
ucking equipment	2-2	



Official:

Chief of Staff.

KENNETH G. WICKHAM,  
Major General, United States Army,  
The Adjutant General.

Distribution:

Active Army:

USASA (2)  
ACSI (1)  
DCSLOG (1)  
CNGB (1)  
TSG (1)  
CofEngrs (8)  
ACSC-E (1)  
Dir of Trans (1)  
CofSptS (1)  
USAMB (1)  
USAIB (2)  
USARABD (2)  
USAAESWBD (2)  
USAAVNTBD (2)  
USA Arty Bd (2)  
USA Armor Bd (2)  
USCONARC (8)  
OS Maj Comd (5) except  
    USARJ (1)  
USASETAF (2)  
USAMC (1)  
USAMECOM (46)  
USACDCEC (10)  
MDW (1)  
Armies (2)  
Corps (2)  
USAC (1)  
Div (2)  
Engr Bde (1)  
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Svc Colleges (2)  
Br Svc Sch (2)  
Gen Dep (10)

Engr Dep (10)  
Army Dep (2) except  
    TOAD (8)  
EAMTMTS (2)  
WAMTMTS (2)  
MOTBA (1)  
MOTBY (1)  
MOTKI (1)  
MOTSU (1)  
Div Engr (2)  
Engr Dist (2)  
Engr Cen (5)  
Engr FLDMS (2)  
Ft Knox FLDMS (10)  
AMS (8)  
MAAG (1)  
JBUSMC (1)  
USARMA (1)  
USARMIS (1)  
USACOMZEUR (2)  
Fld Comd, DASA (8)  
USAREUR Engr Proc Cen (2)  
USAREUR Engr Sup Con Agcy  
USA Mbl Equip R&D Cen (3)  
Units org under fol TOE:  
    5-48 (2)  
    5-287 (5)  
    5-282 (5)  
    5-267 (1)  
    5-278 (5)  
    5-279 (2)  
    5-500(EA, EB) (2)

NG: None.

USAR: Same as Active Army except allowance is one (1) copy for each unit.

For explanation of abbreviations used, see AR 320-50.